

*May 2011*

## NIEHS Spotlight



### [NIEHS leaders help shape regulatory policy](#)

NIEHS leaders joined experts from government, industry, academia and public interest organizations at an April 5-6 workshop on FDA's evaluation of science.



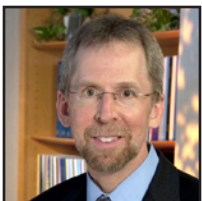
### [NTP board supports folic acid workshop, nanomaterials program, and more](#)

The NTP Board of Scientific Counselors gave several scientific initiatives the "thumbs up" when it met April 13 at NIEHS.



### [Spirit Lecturer advocates diversity in academic medicine](#)

As part of Women's History Month, Duke University School of Medicine Dean Nancy Andrews, M.D., Ph.D., visited NIEHS March 29 to deliver the 2011 Spirit Lecture.



### [NHGRI director reveals roadmap for genomic medicine](#) Video

In his first visit to NIEHS on April 11, Eric Green, M.D., Ph.D., director of the National Human Genome Research Institute, reflected on the past, present, and future of genomics.



### [GEI grantees reflect on program at final annual meeting](#)

About 170 scientists from the NIH Genes, Environment, and Health Initiative (GEI) Exposure Biology Program gathered April 14-15 at NIEHS.

## Science Notebook



### [Hormones and the stress response](#)

According to NIEHS Distinguished Lecturer Ron de Kloet, Ph.D., speaking April 12 at NIEHS, everyday stressors induce specific physiological changes in the body.



### [Symposium charts impact of stress on children's environmental health](#)

NIEHS grantees joined colleagues in the field of children's health March 25 at Duke University to explore "The Social Context of Environmental Exposures in Children."



### [Exercise may protect the brain from chemical-induced injury](#)

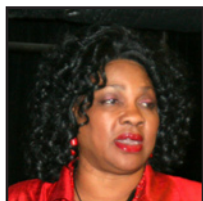
Recent research suggests that exercise may offer some protection against environmental toxicants and neurodegenerative diseases by reducing inflammation in the brain.



### [NTP Peer Review Panel weighs in on Aloe vera extract, other compounds](#) Video

Don't throw out the aloe plant you keep to treat burns, but it might be time to reconsider if you consume certain commercial products containing Aloe vera.

## NIEHS Spotlight



### [Hot Zone summit challenges environmental injustices](#)

A luncheon panel session March 25 featured NIEHS staff and distinguished grantees addressing lessons learned from the Deepwater Horizon oil spill.



### [Thayer presents NTP obesity workshop findings to local communicators](#)

NTP lead scientist Kris Thayer, Ph.D., showcased the breadth of some of the expanded research activities her office is conducting during a talk April 19 at Sigma Xi.



### [New SRP webinars to highlight community engagement successes](#)

An NIEHS Superfund Research Program webinar March 31 kicked off a new series on community engagement, a vital element of SRP projects.



### [NIEHS trainees serve as DNA ambassadors for high schools](#)

Commemorating North Carolina DNA Day, trainees presented molecular biology lectures and hands-on activities to high school students around the state.



### [Remembering James Fouts](#)

The environmental health sciences community lost one of its pioneers April 15 with the death of pharmacologist and Episcopal priest James Fouts, Ph.D., at age 81.

## Science Notebook



### [Economist models effects of global climate change](#)

NIEHS grantee Olivier Deschenes, Ph. D., spoke at NIEHS April 7 as part of the Keystone Science Lecture Seminar Series to discuss his research on this topic.



### [Protecting telomeres involves HipHop protein](#)

NCI geneticist Yikang Rong, Ph.D., presented evidence during an April 11 talk at NIEHS that explained models for maintaining telomeres in the fruitfly.



### [Diet may protect against colon cancer, says NIEHS study](#)

Consuming meat cooked at high temperatures can cause DNA damage in the colon, while eating certain other foods may have a protective effect, according to a new NIEHS study.



### [This month in EHP](#)

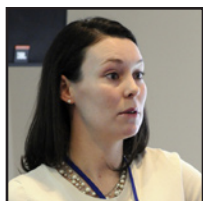
The May issue of EHP highlights a longstanding threat to water quality with a cover story on "Phosphorus Paradox: Scarcity and Overabundance of a Key Nutrient."

## Inside the Institute



### [Fellows urged to nurture careers](#)

Trainees gathered April 19 in Rodbell Auditorium for the annual NIEHS Trainees Assembly General Meeting.



### [Women's history month talk takes aim at cosmetics](#)

NIEHS employees were among some 75 federal employees and guests attending a talk by dermatologist Amy Fox, M.D., on the potential toxicity of personal care products.



### [EHP and NIEHS celebrate Earth Day 2011](#)

EHP is celebrating the 41st anniversary of Earth Day, the birth of the modern environmental movement, with a special page published on April 22.

## Extramural Research

### [Extramural papers of the month](#)

- [Beijing Olympics pollution controls could save lives](#)
- [Amyloid-binding compound extends lifespan in \*C. elegans\*](#)
- [Study finds no link between mercury exposure and cardiovascular disease](#)
- [Mitochondrial, but not nuclear ligase3 is required for cellular viability](#)

## Intramural Research

### [Intramural papers of the month](#)

- [Physiological key player found for glucose-induced insulin secretion](#)
- [Dioxin targets the blood-brain barrier](#)
- [Comparison of global gene expression profiles in response to xenoestrogens](#)
- [Study highlights importance of protein complexes in liver metabolism](#)

## Calendar of Upcoming Events

- **May 3-5 (offsite event)**, at the Renaissance Mobile Riverview Plaza Hotel, Mobile, Ala. — Worker Education and Training Program Spring Awardee Meeting and Technical Workshop: Deepwater Horizon's Lessons Learned Workshop: Improving Safety and Health Training for Disaster Cleanup Workers
- **May 4**, in Rall D-350, 11:30 a.m.-1:00 p.m. — Ariele Zaritsky, Ph.D., speaking on "Manipulating the bacterial cell division cycle by physiological means"
- **May 3-7 (offsite event)**, in Cold Spring Harbor, N.Y. — 2011 Cold Spring Harbor Meeting on Telomeres & Telomerase
- **May 9**, in Keystone 1003AB, 3:00-4:00 p.m. — Keystone Lecture Seminar Series with Michael Skinner, Ph.D., exploring "Epigenetic Transgenerational Actions of Environmental Compounds on Reproduction and Disease"
- **May 12-13**, in Keystone 1003AB, 8:00a.m.-5:30p.m. — Interagency Breast Cancer and Environmental Research Coordinating Committee meeting
- **May 16**, in Rodbell Auditorium, 10:00 a.m.-12:00 p.m. — Laboratory of Molecular Genetics Fellows Invited Guest Lectures Series presentation, speaker TBA
- **May 17**, in Rodbell A, 11:00a.m.-12:00p.m. — Biostatistics Branch Seminar Series presentation by Paul Albert, Ph.D., topic TBA
- **May 18**, in Rall F-193, 11:00a.m.-12:00p.m. — Laboratory of Neurobiology Seminar Series presentation on "The potential role of maternal antibodies in the etiology of autism: Support from a monkey model and the clinical population," by Loren Martin, Ph.D.
- **May 19**, in Rall D-450, 10:00-11:00a.m. — Laboratory of Molecular Carcinogenesis Seminar Series presentation by Susan Henning, Ph.D., "The Elusive Intestinal Stem Cell: Progress and Challenges"
- **May 18-20**, in Rodbell Auditorium, 8:30a.m.-5:00p.m. — National Advisory Environmental Health Sciences Council meeting
- View More Events: [NIEHS Public Calendar](#)



# NIEHS Spotlight

## NIEHS leaders help shape regulatory policy

By Thaddeus Schug

Most Americans spend a large portion of their food budget on processed foods, which, unlike whole foods, contain additives. These substances are meant to affect the characteristics of food, such as preserve it, or alter the color or the way it tastes. Packaging may also be considered an indirect food additive, if it adds a substance to the food. The question is, are these additives safe? And, what scientific evidence should be considered when determining food safety?

Against that backdrop, NIEHS/NTP leaders joined experts from government, industry, academia, and public interest organizations to participate in a workshop titled “Enhancing FDA’s Evaluation of Science to Ensure Chemicals Added to Human Food Are Safe,” held April 5-6 at the Pew Conference Center in Washington, D.C. The workshop was co-sponsored by the U.S. Food and Drug Administration (FDA), the Institute of Food Technologists (IFT), the journal Nature, and the Pew Health Group.

The goal of the meeting was to develop a better understanding of the current system FDA uses to assess the safety of chemicals added to human food, and to explore opportunities to improve the use of all scientific studies, both industry-backed and hypothesis-driven, in FDA’s risk assessment decision making.

NIEHS/NTP Director Linda Birnbaum, Ph.D., headed the NIEHS/NTP delegation, which included Division of Extramural Research and Training (DERT) Program Administrator Jerry Heindel, Ph.D., and Ray Tice, Ph.D., chief of the NTP Biomolecular Screening Branch and High-Throughput Screening Initiative coordinator.

In her opening remarks to the group, Birnbaum explained that many of the programs sponsored by NIEHS — NTP studies and initiatives, along with intramural and extramural research — “provide valuable scientific information that should be used by FDA to shape regulatory policy.” She said, “Understanding the hazards and risks that chemicals pose to biological systems can be incredibly complicated, and, therefore, it is imperative that all available data be incorporated into the regulatory framework.”



*Birnbaum noted that GLP alone does not guarantee a good study or that the right question was asked. “Make sure that the best available science is utilized and incorporated in our understanding of risk,” said Birnbaum. (Photo Courtesy of the Pew Health Group)*



*Tice presented an overview of role that the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) plays in developing regulatory policy. (Photo Courtesy of the Pew Health Group)*

## Food additive regulation

The FDA is tasked with regulating food additives and has developed guidelines for testing protocols that should be met by manufacturers before products are deemed safe. Traditionally these studies have been performed by industry-funded contracting labs under conditions referred to as good laboratory practice (GLP).

However, in the past few years, controversy has emerged regarding the safety of several food additives, such as BPA, which is contained in the linings of plastic bottles and canned foods. Many researchers maintain that current guideline-based studies are not sufficient to capture all adverse human health effects.



*Michael Taylor, J.D., Deputy Commissioner for Foods at FDA, reviewed the complicated regulatory process applied to food additives. (Photo Courtesy of the Pew Health Group)*

The workshop was divided into mediated sessions, in order to focus, facilitate, and identify solutions in four contentious areas: identifying and validating relevant endpoints, evaluating study design and data for regulatory decisions, developing and reviewing test guidelines, and identifying and evaluating solutions.

The Pew Health Group plans to use feedback from each discussion session to develop recommendations for regulators and others to consider when evaluating food safety. The group will publish a proceeding of the workshop in a peer-reviewed scientific journal.

(Thaddeus Schug, Ph.D., is a postdoctoral research fellow in the NIEHS Laboratory of Signal Transduction and a regular contributor to the Environmental Factor. He is currently on detail as a program analyst in the NIEHS Division of Extramural Research and Training.)



*Event organizer Maricel Maffini, Ph.D., senior officer of the Food Additives Campaign at Pew Health Group, listens in on one of several discussion sessions. (Photo Courtesy of the Pew Health Group)*



*The meeting included a well-balanced mix of scientists representing industry, academia, and government agencies. Shown here is the main conference room within the newly renovated Pew Conference Center located in Washington, D.C. (Photo Courtesy of the Pew Health Group)*

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# NTP board supports folic acid workshop, nanomaterials program, and more

*By Ernie Hood*

The NTP Board of Scientific Counselors (BSC) gave several scientific initiatives the “thumbs up” when it met April 13 at the Rodbell Auditorium on the NIEHS main campus.

Among the projects supported by the BSC was a workshop concept proposed by the Center for the Evaluation of Risks to Human Reproduction (CERHR), which is slated to be re-named the Office of Health Assessment and Translation under the impending re-organization of NTP. The workshop, to be held in March 2012 in Washington, D.C., will focus on clarifying the potential adverse health effects of excess intake of folic acid. The event is being developed in conjunction with the NIH Office of Dietary Supplements (ODS).



*The NTP Board of Scientific Counselors reviewed several proposed new programs at its April 13 meeting. (Photo courtesy of Steve McCaw)*

## Workshop on excess folic acid supplementation

While folic acid supplementation to prevent neural tube defects has been one of the major public health success stories of recent years, a growing body of research suggests that folic acid intake over the recommended daily allowance may be associated with adverse health effects in adults and children, including *in utero* exposure developmental and epigenetic effects, cardiovascular disease, cancer incidence and progression, and neurological and psychiatric disorders.

The proposed workshop will gather experts to review and clarify current related human literature, as well as animal and *in vitro* literature as it may apply to humans, and will identify data gaps to help guide future research.

Although the BSC was not unanimously behind the project, overall the panel members were enthusiastic in their support. U.S. Food and Drug Administration liaison Paul Howard, Ph.D., commented that the effort was reminiscent of CERHR’s work on bisphenol A. “I think this is an excellent opportunity to do the same thing,” he said. “People are making decisions without knowing the full basis of the literature and having vetted it, and this is an excellent service by NTP and NIEHS — to get experts together, vet the literature, and say, ‘This is what stands up as being good science.’”



*NTP Associate Director John Bucher, Ph.D., updated the panel on NTP activities and development since the last BSC meeting in January. (Photo courtesy of Steve McCaw)*

## Testing safety of engineered nanomaterials

The BSC also favored another NTP research concept presented at the meeting — a collaboration with the National Institute for Occupational Health and Safety (NIOSH) Nanotechnology Research Center to extend and expand field exposure assessment studies involving engineered nanomaterials. The proposal covers a three-year period, during which NIOSH will conduct exposure assessment surveys at 12 sites involved in the manufacture or use of 16 representative manufactured nanomaterials determined by the Organisation for Economic Co-operation and Development. The materials include well-known and highly used nanoparticles such as fullerenes, single-walled carbon nanotubes, and titanium dioxide, as well as lower-profile or emerging nanomaterials such as graphene platelets and nanocrystalline cellulose.

With the economic importance and use of engineered nanomaterials rapidly increasing, many questions about their impact on health and safety remain unanswered, particularly in occupational settings, where human exposure is most likely. The proposed NTP/NIOSH nanotoxicological studies will target dermal and inhalation exposures in the workplace, examining endpoints such as inflammation, oxidant stress, fibrosis, and translocation. The investigations will increase the overall body of knowledge on the characterization, volume, and specific applications being developed for nanomaterials intended for commercialization, and will help guide future decisions about which nanomaterials to test and how to test them.

Some BSC members felt that the scale of the proposed program was too limited given the scope of the issues involved, but were reassured when NIEHS/NTP Director Linda Birnbaum, Ph.D., reminded them that it was just one part of the much wider NIEHS/NTP efforts in nanosafety research. “This is just one piece of a much larger puzzle,” she said.

(Ernie Hood is a contract writer for the NIEHS Office of Communications and Public Liaison.)

### In other business

At its April 13 meeting, the board also voted in favor of a contract concept for recompetition of an existing contract for research into chemicals, drugs, or other environmental agents that are potential hazards affecting the human immune system. The new contract will increase emphasis on evaluation of developmental immunotoxicity. The BSC was also updated on NTP’s modified one-generation reproduction study design, statistical methods used in NTP Technical Reports, and a proposed new network of biospecimen repository resources.



*Dori Germolec, Ph.D., briefed the BSC on the contract recompetition for investigation of agents that may induce immunotoxicity. (Photo courtesy of Steve McCaw)*



*The “ayes” had it, and the BSC voted to approve the contract concept on immunotoxicity. (Photo courtesy of Steve McCaw)*



*David Eastmond, Ph.D., of the University of California at Riverside, chaired the April 13 NTP BSC meeting. (Photo courtesy of Steve McCaw)*

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# Spirit Lecturer advocates diversity in academic medicine

By Erin D. Hopper

In recognition of Women's History Month, Duke University School of Medicine Dean Nancy Andrews, M.D., Ph.D., visited NIEHS March 29 to deliver the 2011 Spirit Lecture. The Spirit Lecture is an annual NIEHS event that honors women who have made significant contributions to their field while maintaining a rich and meaningful personal life. In her talk, "Reflections on the Glass Ceiling," Andrews chronicled her experiences and observations as a female scientist who has forged a path to the top of the academic career ladder.

## Climbing the career ladder

In 2007, Andrews made headlines when she became vice chancellor for academic affairs and dean of the Duke University School of Medicine. Upon accepting this position, she became the first female dean of medicine at Duke and the first and only female dean of a top-ten medical school. By excelling at all levels of the academic career ladder, Andrews has challenged traditional gender roles and inspired other women to do the same.

Andrews carefully outlined the state of women in academics, noting that less than 30 percent of associate professors and less than 20 percent of full professors are women. In reference to the seriousness of the situation, Andrews quoted Professor Timothy Ley, M.D., of Washington University, who calls the scarcity of women in academia the "global warming" of academic medicine.

Several alarming trends threaten diversity in academic medicine. While the number of women entering the medical field is increasing, very few are filling positions in academia. Only half as many females as males apply for first-time research (R series) grants, and even more concerning, only one third as many females as males apply for subsequent R series grants. This trend occurs despite the fact that women are equally as successful as men at obtaining these grants.



*Andrews shared a number of relevant anecdotes from her highly successful academic career. She pointed to women's success despite thoroughly ingrained gender roles, which tend to impede women's progress in academic medicine. (Photo courtesy of Steve McCaw)*



*Shown, left to right, Molly Vallant, chair of the Spirit Lecture Committee, joined Andrews, holding the Spirit sculpture, NIEHS Diversity Council Chair Brad Collins, and NIEHS/NTP Director Linda Birnbaum, Ph.D., who introduced the speaker. (Photo courtesy of Steve McCaw)*

## Opting for a different path

Why do women veer off the academic career path? Andrews explained that a significant driving force for this trend is that women receive a multitude of signals alluding to the difficulty of combining a successful academic career with a happy family life. Andrews feels that the myth is greater than the reality in this case, but, nevertheless, these signals seem to contribute to women's career decisions.

Andrews also addressed the unfortunate reality that women must "supercompete" with men to advance in academic medicine; that is, women must outperform their male counterparts to be considered as academic equals. Andrews addressed this issue honestly and directly, saying, "I think it's still true that the playing field of academic medicine tilts against women, has potholes and maybe even landmines for women, and has too few referees to keep the game fair."

In a final offer of explanation, Andrews noted that women in the medical field lack role models who are capable of demonstrating what is possible for women in academic science. When faced with the difficulty of navigating the academic career path without role models to lead the way, many women seem to be opting out of academia, deciding that other careers may be more rewarding or less risky.

The lecture concluded with a tone of hope, as Andrews noted that the climate for women in science may be slowly improving, and she made several suggestions for further improving the climate. She advocated the establishment of a new academic culture that favors a positive work/life balance, and endorsed the replacement of leaders with poor track records of equity. "Brilliance and ability are not restricted to certain groups," Andrews asserted, adding, "We need to communicate the message that diversity is not only the right way to do business, but also the most successful way to do business."



*During the post-lecture reception, Veronica Godfrey Robinson, left, engaged Beth Anderson, center, and Andrews in an animated conversation about persistent inequities between men and women in academic medicine. (Photo courtesy of Steve McCaw)*



*The Spirit Lecture Committee celebrated another uplifting event in the ten-year series of talks by distinguished scientific women. Pictured left-to-right are Suramya Waidyanatha, Ph.D., Birnbaum, Angela King-Herbert, D.V.M., Vallant, Robinson, Andrews, Collins, Diane Spencer, Marsha Johnston, and Grace Kissling, Ph.D. (Photo courtesy of Steve McCaw)*

(Erin D. Hopper, Ph.D. is a postdoctoral fellow in the NIEHS Laboratory of Structural Biology Mass Spectrometry Group.)

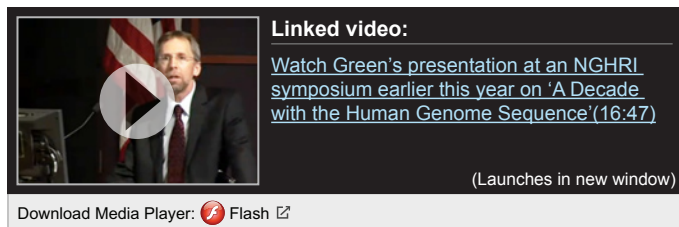
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# NHGRI director reveals roadmap for genomic medicine

By Ed Kang

In his first visit to NIEHS on April 11, Eric Green, M.D., Ph.D., director of the National Human Genome Research Institute, reflected on the past, present and future of genomics. In looking back 20 years to the genesis of the \$1 billion venture known as the Human Genome Project, Green recognized that the complete sequencing of the human genome was not the end, but merely the beginning of a decades-long journey towards individualized medicine.



*In his February presentation, as well as his talk at NIEHS, Green charted a course for genomic medicine and offered an exciting glimpse into contemporary genomics research, illustrating how the field can be used to further groundbreaking medical discoveries. (Photo courtesy of NIH)*

## A path forward

Green's vision for his institute is to "establish the path towards realizing genomic medicine."

A 2 1/2 year, collaborative strategic planning process, much like the one NIEHS is currently undertaking, yielded a [new vision](#) for NHGRI that spans basic research into how the human genome is organized to clinical applications that will use knowledge of the genome to develop new diagnostics, therapeutics, and preventions.

Green described research priorities that begin with understanding the structure and function of human and comparative genomes. From this basis, scientists will have a solid foundation to evaluate and catalog human genomic variation to ultimately better understand disease and health risk. Green referenced a growing body of literature pointing to functional contributors within the genome that determine normal, healthy biology, as well as those that, when altered, lead to common as well as rare diseases.

"One of the promises of the Human Genome Project can now be seen at the distant horizon – the merging of genomics and medicine. Researchers around the world are working towards a future when health care providers will use information about our individual genomic blueprint to better diagnose and treat disease," Green postulated.



*Green's tour of the Institute allowed him the opportunity to meet a few NIEHS researchers, who described, with great enthusiasm, their projects. After a stop with Senior Associate Scientist [Dmitry Gordenin, Ph.D.](#), Green visited with Research Fellow [Sergei Nechaev, Ph.D.](#) (Photo courtesy of Steve McCaw)*

## At the nexus of genomics and computing

New sequencing technologies are a major driver of new developments in genomics research. While it took 13 years to produce the first human genome sequence, one machine can now produce a human-sized sequence in about five days.

“These next gen sequencing technologies have completely changed the face of genomics, and will continue to do so,” Green stated. Further technological improvements will be critical to successfully integrate genomic knowledge into clinical care. Green calls for fast, low-cost — approximately \$1,000 — whole genome sequencing, which would then be financially accessible in a clinical setting.

Further, Green described a bottleneck in biomedical research where current datasets are so vast and complex that there is a growing need for massive hardware and software, as well as people, to manage this growing pool of data. Development of new analytical methods, software tools, and a robust computational infrastructure will be essential. Interdisciplinary research, combining the best of biology, genetics and informatics, will also be needed to access the mountains of complex genomic data that will be gathered from thousands of individuals, according to Green.

## Base pairs to bedside

“Our plan maps the next steps to not only discover medical secrets hidden within the human genome, but to bring those discoveries to the practitioner and patient,” Green said, referring to the expansion of genomic approaches which already inform some medical treatments, particularly in dealing with breast and colorectal cancer. These successes demonstrate that genomic science is already having an impact on medical care, with potentially much wider applications as genomics increasingly becomes an integral part of health research and development.

With this ever-expanding body of knowledge, scientists will likely identify the genetic basis of most single-gene disorders in the next decade. Furthermore, molecular pathways that are implicated in single-gene disorders may hold important clues for the diagnosis and treatment of common, multigene disease, Green alluded.

The next revolution in health care, according to Green, will be to deliver therapeutics tailored to the genetic make-up of the individual. Unlocking the genome to evaluate the genetic components of human disease, cancer, and the microbiome will be a leap forward in protecting human health.

(Ed Kang is a public affairs specialist in the Office of Communications and Public Liaison and a contributor to the Environmental Factor.)



*With genomic — and epigenomic — investigations playing an influential role in the future of environmental health science, many NIEHS scientists listened with keen interest to Green's message. (Photo courtesy of Steve McCaw)*



*Green's message left no doubt as to the value of investments in human genome sequencing efforts. “We are at an interesting time in history,” he noted. Then in reference to a February 2010 [cover story](#) in Nature, he added, “The future is bright.” (Photo courtesy of Steve McCaw)*



# GEI grantees reflect on program at final annual meeting

By Matt Goad

About 170 scientists from the [NIH Genes, Environment, and Health Initiative \(GEI\) Exposure Biology Program](#) gathered April 14-15 at NIEHS for the program's fourth annual grantee meeting. Grantees showed off the results and successes of their studies, and learned about how to proceed as the program comes to a close.

The Exposure Biology Program focuses on the development of innovative technologies to measure environmental exposures, diet, physical activity, psychosocial stress, and addictive substances that contribute to the development of disease, and identifies markers of the biological response to these factors.

David Balshaw, Ph.D., a program administrator in the NIEHS Center for Risks and Integrated Sciences, said the work of this program has changed science. "We have changed the way personal exposures are measured," he said. "We've developed tools that will allow you look at multiple exposures, to look at the interaction between physical activity, dietary assessment, and chemical exposure simultaneously."

## The exposome

After a welcome by NIEHS/NTP Director Linda Birnbaum, Ph.D., and an overview of the accomplishments of the program by Gwen Collman, Ph.D., director of the NIEHS Division of Extramural Research and Training, Stephen Rappaport, Ph.D., of the University of California, Berkeley, gave a presentation on the exposome as a paradigm for environmental health. As Rappaport explained, the "exposome," a word coined in 2005, is a collection of all the exposures people have over their lifetimes ([see related story](#)).

"The exposome really does change the way we think about environmental health," Rappaport explained. "It increases the coverage from air and water pollution, which is the primary factor people think about when the term 'environment' is used, to all chemicals. So essentially, it's everything except the genes."

The study of the exposome, Rappaport added, will result in a shift of how exposures are measured, from qualitative self-reports to quantitative measurements. Therefore, researchers need new methods to make these measurements. Much of the rest of the first day of the meeting was devoted to discussions and presentations on the development and distribution of new sensors, including posters and demonstrations by grantees.



*The keynote address by Rappaport, above, outlined an emerging paradigm in epidemiological studies as scientists strive to measure individual exposures more comprehensively and accurately than previously possible. (Photo courtesy of Steve McCaw)*



*Jianwei Mo, Ph.D., (left), vice president of Kumetrix, demonstrates a sensor that measures levels of heavy metals in the blood. Kumetrix developed the device with help from an NIEHS Small Business Innovation Research grant. (Photo courtesy of Steve McCaw)*

Carol Boushey, Ph.D., a dietitian from Purdue University, showed off an iPhone app her team is working on that records what foods study participants eat. The traditional way to measure this would be a questionnaire, which comes with inherent flaws in accuracy and lacks details, Boushey said. Using the app, individuals take a photo of what they eat, and the app is able to identify foods and tell what amounts are on the plate.

Her team hopes to build the app into a tool that can be marketed to other researchers.

### Exploring together

The best part of the grantee meeting, Boushey said, was getting to meet other researchers studying the exposome. “We get to see what other people are working on, so one day, maybe we’ll be able to team up and really study the whole exposome,” she said.

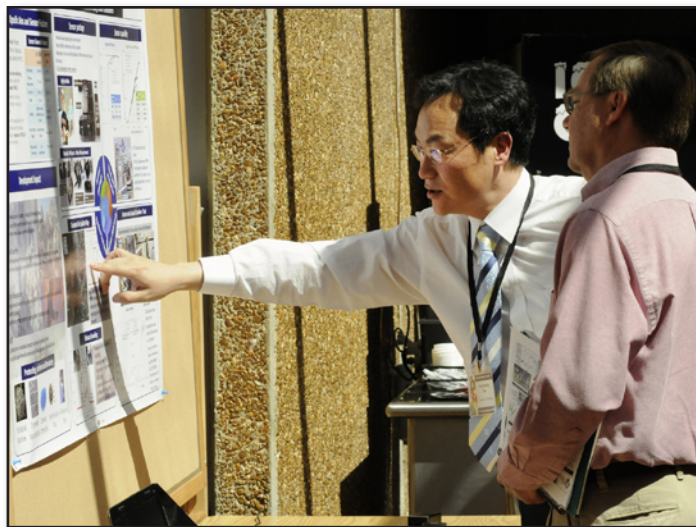
In his closing comments, Balshaw also mentioned the teamwork he’s seen in the program. “I’ve been involved in a lot of very, very large programs across NIH,” he remarked. “I’ve never seen a group of investigators who have come together like this group has, who have worked as hard, or who have been as productive.”

Although this was the program’s last meeting, the work will continue as the grantees prepare their products for distribution through the market for others to use.

Balshaw said the success of the project will be measured not just by the number of publications, which has been impressive in and of itself, but also by the measuring devices and biomarkers that the teams develop and the translation of those products into understanding how the environment influences human health.

The second day of the meeting was devoted to individual steering committee meetings.

(Matt Goad is a contract writer with the NIEHS Office of Communications and Public Liaison.)

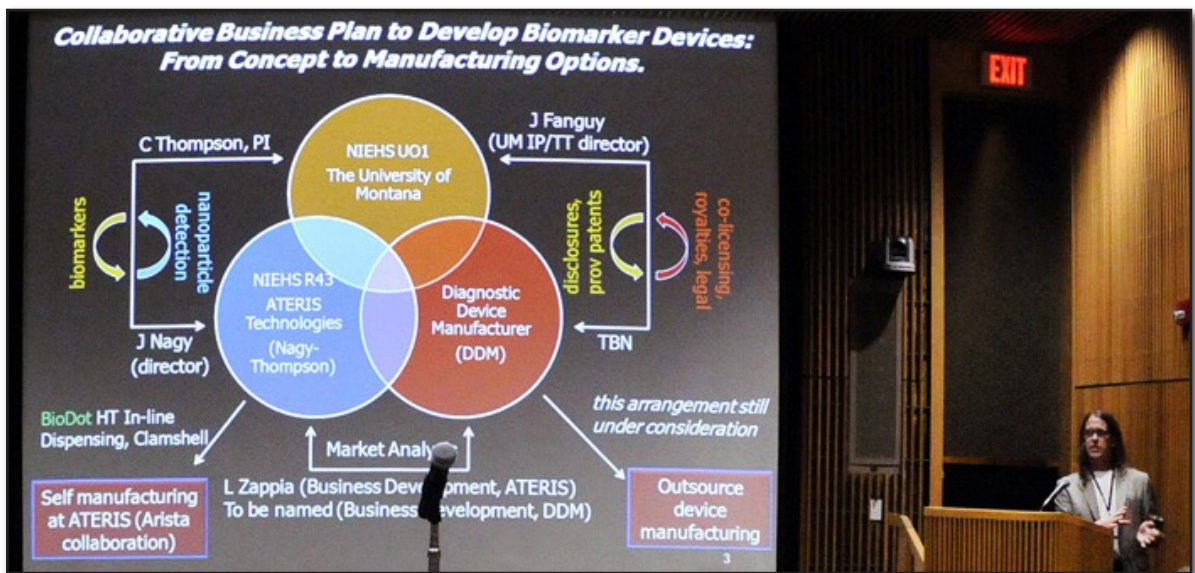


*Sang Young Son, Ph.D., (left) explains his poster on his sensor for ultrafine particles. Son took measurements around the NIEHS side of the lake on campus and discovered some high numbers at the smoking area outside of C-module. (Photo courtesy of Steve McCaw)*



*Shown in the foreground with Balshaw, Charles Thompson, Ph.D., a professor at the University of Montana and co-owner of ATERIS Technologies, spoke to GEI grantees about the challenges and advantages of owning a small business to develop a sensor product while remaining in academia. (Photo courtesy of Steve McCaw)*





Thompson used a Venn diagram to explain how his work as a professor, NIH grantee, and small business owner intersect. Thompson decided to take unpaid time off from his professorship duties while working to start ATERIS, a small biotech company specializing in biosensor research and development. (Photo courtesy of Steve McCaw)



Shown, left to right, Stephen Intille, Ph.D., Steven Chillrud, Ph.D., Thompson, and Mark Rea, Ph.D., participate in a panel discussion on distributing the products of the Exposure Biology Program, moderated by Balshaw, at the podium. (Photo courtesy of Steve McCaw)



Gary Bennett, Ph.D., of Duke University, spoke of the challenges and benefits of adopting new sensors. In one study, Bennett said, researchers planned to use a sensor strapped to study participants' legs, until the participants got a look at them and said they were too much like the ankle monitors used by penal systems. (Photo courtesy of Steve McCaw)

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# Hot Zone summit challenges environmental injustices

By Ed Kang

The joint annual meeting of the [National Institute of Science \(NIS\)](#) and [Beta Kappa Chi \(BKX\) Scientific Honor Society](#) included a luncheon panel session March 25, featuring NIEHS Worker Education and Training Program (WETP) staff and distinguished grantees addressing lessons learned from the Deepwater Horizon oil spill.

The overall theme for the 2011 conference, held March 23-27 in Atlanta, was “Effect of Environmental Pollutants on the Biosphere.” Organizers received conference grant funding from National Institutes of Health

The luncheon session, titled “The Hot Zone Summit: Environmental Health Impact and Outcome of the Gulf Oil Spill,” provided the audience of 500 students and faculty from 40 historically black colleges and universities (HBCUs) insights into the ongoing adversity plaguing Gulf communities. The summit opened with a short video developed by the NIS, titled “Environmental Injustices - Impacts and Outcomes,” focusing on such environmental tragedies as the Gulf oil spill, Hurricane Katrina, Cancer Alley, and the concept of environmental justice.

## Oil spill to the landfill

One such injustice stems from the disposal of thousands of tons of BP oil spill waste. While much media attention has focused on clean-up efforts and the health and safety of workers, not much detail has been disseminated about landfills in predominantly underrepresented communities that are filling up with oil and other toxic by-products.

Robert Bullard, Ph.D., director of the Environmental Justice Resource Center at Clark Atlanta University, addressed the disparity in his keynote talk at the session, “Geography of Vulnerability: Tracking Environmental and Public Health Impact of the BP Deepwater Horizon Oil Disaster.” Bullard spoke passionately about the dumping of oil spill waste in African-American and other communities of color, adding insult to areas already strained by environmental tragedy. Bullard, a long-time NIEHS WETP grantee, called upon the combined efforts of government, healthcare, research institutions and communities to work collaboratively to mitigate the public health impacts of the Deepwater Horizon oil disaster.

Bullard’s sentiment was echoed in remarks by Beverly Wright, Ph.D., professor of sociology and founding director of the Deep South Center for Environmental Justice at Dillard University. Wright, also an NIEHS WETP grantee, pointed out the urgent need to involve Gulf Coast communities in matters of environmental health.



*Bullard, foreground, is considered by many to be the father of environmental justice (EJ). His many books include “Dumping in Dixie: Race, Class and Environmental Quality,” which has become standard reading in the EJ field. At the table behind him, left to right, are Wright, Johnson-Thompson, and Beard. (Photo courtesy of Sharon Beard)*



**ENVIRONMENTAL INJUSTICES**  
IMPACTS & OUTCOMES

**Linked video:**

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## NIEHS on the front lines

Sharon Beard, industrial hygienist in the NIEHS WETP, rounded out the session by highlighting the Institute's efforts through the Minority Worker Training Program to educate and deploy workers from local communities during moments of crisis. In her overview of NIEHS' response to the Deepwater Horizon oil spill, she spoke of Institute-supported efforts that resulted in more than 150,000 workers being trained and the development of an oil spill response booklet. Beard also discussed the recently initiated GuLF STUDY, which will evaluate the long-term health effects of the Gulf oil spill in workers and others. This study will influence the public health strategy in Gulf communities and for future oil spills, as part of the ongoing NIEHS' [response](#) to the oil spill.

The panel was chaired by Marian Johnson-Thompson, Ph.D., professor *emerita* in the Department of Biology at the University of the District of Columbia and former director of Education and Biomedical Research Development at NIEHS. In addition to Bullard, Wright, and Beard, the panel included Gail Mattox, M.D., chairperson and professor of clinical psychiatry and behavioral sciences at the Morehouse School of Medicine, and Timothy Fields, Jr., senior vice president of MDB, Inc., contractor for WETP and the NIEHS Superfund Research Program.

(Ed Kang is a public affairs specialist in the Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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## Partnership tackles effect of pollutants on the biosphere

Established in 1943, the NIS is one of the oldest national scientific membership organizations to serve students and staff from HBCUs. The NIS strives to increase the numbers of well-trained minority scientists by providing academic support, research experience, internship opportunities, and career advice. Since 1921, the BKX society has promoted student scientific fellowship at nearly all HBCUs. Today, over 50 BKX chapters and 11,000 members promote scholarship in pure and applied sciences.

This year marks the 68th joint meeting of these two independent scientific organizations, providing a national forum for minority scientists and students to come together, exchange information, and present research data. Originally a meeting for African-American students and scientists, the meeting has expanded to embrace several different minority institutions including Universidad Metropolitana in San Juan, Puerto Rico, which consistently participates. Ninety percent of the students who attend the meetings are science, technology, engineering, or math undergraduates in their sophomore, junior, or senior years.

## Thayer presents NTP obesity workshop findings to local communicators

*By Robin Mackar*

Kristina Thayer, Ph.D., director of the newly named Office of Health Assessment and Translation (OHAT) in the National Toxicology Program (NTP), showcased the breadth of some of the expanded research activities her office is engaged in during an April 19 lunchtime talk at Sigma Xi headquarters in Research Triangle Park, N.C.

When the organizer of the local monthly lecture series was looking for a compelling speaker who could talk about the growing body of evidence linking chemicals and diseases to a group of local freelance writers and science communicators, Thayer seemed the natural choice.

Thayer was soon issued an invitation by the scientific research society to present findings from a workshop hosted Jan. 11-13 by the NTP, titled “[Role of Environmental Chemicals in the Development of Diabetes and Obesity.](#)”

Thayer began her talk by sharing the rationale for why the NTP sponsored the workshop earlier this year, including the fact that although 70 percent of type 2 diabetes is attributed to being overweight, 30 percent is caused by other factors, which may be environmental. She then shared some of the data that was critically reviewed by the 130 experts who gathered at the January meeting that lead them to conclude that there was plausibility for what is often referred to as the “obesogen” hypothesis.

“Although caloric intake and lack of exercise are still recognized as the predominant contributors to diabetes and obesity, the workshop identified that chemicals in our environment also play a role,” Thayer said. Maternal smoking with increased risk of offspring being overweight or obese later in life was one of the strongest associations that was found.

During her talk, Thayer also alluded to the fact that the workshop was the first example of how the [NTP Center for Evaluation of Risks to Human Reproduction \(CERHR\)](#) was broadening its scope. The NTP CERHR, known for its national role in carefully sifting through hundreds of studies to determine if a particular substance, such as bisphenol A, is harmful to development or reproduction, was now beginning to expand its reach to look at other endpoints. CERHR has been renamed OHAT to address a broader range of health effects ([see editorial](#) in the May issue of Environmental Health Perspectives).

Under Thayer’s leadership, OHAT will become a scientific analysis program within the NTP that conducts health assessments on a wide variety of emerging health topics. For example, one of the topics OHAT expects to home in on in the coming year is the potential developmental effects of cancer chemotherapy during pregnancy.

Thayer entertained questions at the end of the talk and was able to point out how the workshop has already helped the NTP and NIEHS establish new research directions. Several new funding announcements out of the NIEHS Division of Extramural Research and Training, including “[Role of Environmental Chemical Exposures in the Development of Obesity, Type 2 Diabetes and Metabolic Syndrome](#)” and “[Dietary Influence on the Human Health Effects of Environmental Exposures,](#)” demonstrate NIEHS commitment to this important area.



*In their editorial, Thayer and co-author NTP Associate Director John Bucher, Ph.D., wrote that they envision OHAT becoming the NTP focal point for the thoughtful and deliberative integration of relevant information of all types in health assessments for the protection of public health. (Photo courtesy of Steve McCaw)*



*NIEHS Employee Services Support Specialist Dick Sloane was very pleased to make it over to the lunchtime talk at Sigma Xi, saying it gave him a broad overview of an important public health topic that he can share with his students at Durham Tech. (Photo courtesy of Steve McCaw)*





*On hand for Thayer's talk were lecture host Associate Editor Cathy Clabby, right, and Senior Editor Fenella Saunders of American Scientist magazine, which hosts the series of lunchtime talks. (Photo courtesy of Steve McCaw)*

(Robin Mackar is the news director in the NIEHS Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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## New SRP webinars to highlight community engagement successes

*By Matt Goad*

An NIEHS [Superfund Research Program \(SRP\)](#) webinar March 31 kicked off a new series on community engagement, a vital element of SRP projects. The two-hour webinar, part of the [Risk e-Learning "Community Engagement: New Approaches and Success Stories"](#) series, focused on achievements by two SRP grantees, one in Kentucky and one in the Los Angeles area.

Beth Anderson, a program analyst with SRP and moderator for the webinar, explained the importance of community engagement by noting that with any kind of science, the results from the laboratory will not be the same as what scientists experience in the real world.

"By working with the community, getting their insight and their knowledge, and being able to factor that into what you're doing, that makes your work more relevant and ultimately more applicable," Anderson said. "There's a lot of knowledge in the community, and it can really influence how you approach a problem."

### A strong history of community involvement

"The Superfund Research Program, as well as NIEHS, has a strong history of seeking opportunities for working with communities and sharing research findings in a useful and informative manner," said



*Hoover, an SRP grantee from the University of Kentucky, brought current events to center stage, in describing the groundwater contamination stemming from the Paducah, Ky., uranium-enrichment plant. (Photo courtesy of Anna Hoover)*

NIEHS Director Linda Birnbaum, Ph.D., in her opening remarks. “Furthermore, our Superfund Research Program’s strategic plan identifies the individuals and communities living near hazardous waste sites as key stakeholders in our research and the activities that come from the Superfund program.”

Anna Goodman Hoover, communications director at the Kentucky Water Resources Research Institute (KWRI) at the University of Kentucky, presented on community-driven visions of the Paducah Gaseous Diffusion Plant (PGDP), which has been affected by trichloroethylene (TCE) and technetium-99 (Tc-99) contamination in the groundwater.

PGDP, the only operating uranium-enrichment plant in the United States, is closing in the next 5-10 years, and the KWRI was brought in to work with the community to identify future uses for the site. The KWRI looked at converted sites in Colorado and Tennessee to determine the best way to proceed.

“One thing we learned from the politics of cleanup is that future-use decisions that are made unilaterally without input from community members run the risk of being inconsistent with those local needs, as well as with the core values held by local governments and others in the affected communities,” Hoover explained.

“Surveys with the people of Paducah revealed that community engagement was taking place in regards to the PGDP, but that it was not at a level that satisfied the community,” Hoover said.

NIEHS Center for Risk and Integrated Sciences Director William Suk, Ph.D., asked about the long-term prospects of increasing credibility over generations, considering that there is enough TCE in the soil to remain for 100 years or more.

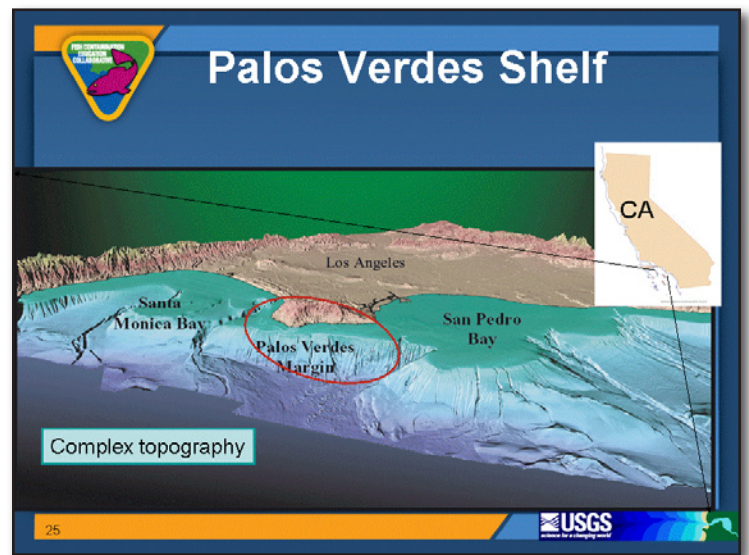
“The bones are in place to continue working on these issues, and we plan to turn our data over to the community,” Hoover responded. “The process is there and adaptable as the situation changes.”

### **Propagating safer fish eating practices near Los Angeles**

Next, Sharon Lin of the U.S. Environmental Protection Agency (EPA) gave her presentation on fish contamination education at the Palos Verdes Shelf Superfund site near Los Angeles.

The Montrose Chemical Company in Torrance, Calif., released the chemical DDT into the Los Angeles County sewer system from the 1940s to 1970s, which emptied into the ocean around the Palos Verdes Peninsula. The chemicals remain in the ocean sediment and have gotten into the fish there, especially the white croaker, a bottom feeder with a lot of fatty tissue where the chemical can collect.

“Through monitoring, education, enforcement of bans and limits of croaker fishing in the area and promotion of catch-and-release fishing of white croaker, the EPA, working with local officials, has been able to reduce the number of white croaker brought home from fishing piers and appearing in markets near the Palos Verdes Shelf,” said Lin.



*The Palos Verdes Shelf Superfund site is one of the largest DDT and PCB contaminated sediment sites in the country. EPA has developed a community-based social marketing approach to educate local fishermen and community members about health risks of eating contaminated fish and to promote safer fishing and fish eating practices. (Graphic courtesy of the U.S. Geological Survey)*



The program also promoted the consumption of skinless fillets rather than whole fish, as it is a healthier alternative. “By just changing that one little behavior, we can reduce risk tenfold,” Lin said.

(Matt Goad is a contract writer with the NIEHS Office of Communications and Public Liaison.)

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## NIEHS trainees serve as DNA ambassadors for high schools

*By Jeffrey Stumpf*

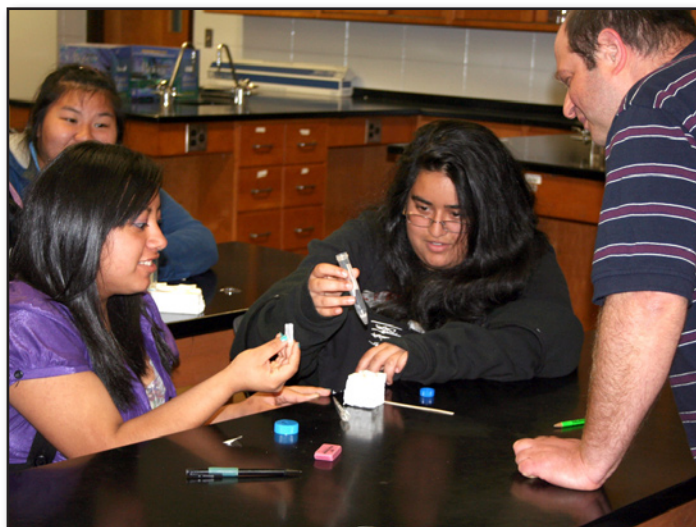
A mundane spring Friday of high school biology classes turned into a salivating discussion of forensics, thanks to trainees from NIEHS. Commemorating [North Carolina DNA Day 2011](#), the volunteers presented molecular biology lectures and hands-on activities to students at high schools around the state.

NC DNA Day and parallel events nationwide honor the completion of the Human Genome Project in 2003 and the publication by Watson and Crick of the DNA double helical structure in 1953. The goal is to teach current, exciting genetic lessons to over 200 high school classrooms. NIEHS trainees joined students from area universities to travel as far as Hickory to promote the study of genetics to North Carolina youths.

Jana Stone, Ph.D., a postdoctoral trainee in the NIEHS Laboratory of Molecular Genetics (LMG) and veteran DNA ambassador, served as the liaison between the DNA Day organizers at the University of North Carolina (UNC) and NIEHS trainees.

For trainees, DNA day was an opportunity to practice teaching and presenting science in a unique way. “I participated in DNA day because I love doing science and I am always looking for opportunities to share it,” said Sonika Patial, Ph.D., a postdoctoral trainee in the NIEHS Laboratory of Signal Transduction (LST).

DNA ambassadors, such as Valerie Davis, Ph.D., from the NIEHS Laboratory of Molecular Carcinogenesis (LMC), became the face of the modern-day, real-life scientist that can relate to today’s students. “I wanted to get students excited about science and show them that it’s not only older men who do research,” said Davis. “Interacting with scientists allows students an opportunity to discover what a science career could be like.”



Covo, right, helps students at Challenger Early College High School in Hickory to extract DNA from their own saliva. (Photo Courtesy of Molly Barlow)



LMG postdoctoral trainee Amy Abdulovic-Cui, Ph.D., left, demonstrates the concepts of restriction enzyme digestion to students at a North Carolina high school. (Photo courtesy of Amy Abdulovic-Cui)

## Students extract DNA from spit

In addition to teaching the structure and function of DNA, trainees taught the class how to extract their own DNA from their saliva. The extraction protocol took only a few minutes and used soap, salt, and rubbing alcohol.

Because high school students rarely are asked to spit on anything, let alone an experiment, the lesson was refreshing, and the results were rewarding. “I heard comments like, ‘So, this is my DNA? That is so cool!’” commented Julie Lowe, Ph.D., a postdoctoral trainee from LMG. Another postdoctoral trainee from LMG, Shay Covo, Ph.D., agreed, “While some were reluctant to deal with their own body fluids, all of them were really amazed to actually see DNA.”

## High school class solves mascot heist

In addition to lecturing about DNA, NIEHS trainees used the kind of forensics seen in modern television dramas to discuss common molecular biology techniques. The classes learned how DNA is collected and analyzed to determine whether a suspect was involved in a crime.

The students were presented with “an urgent announcement from the principal” that their rival high school had stolen the mascot and sent a ransom letter to them. In this scenario, the envelope was sealed, meaning that DNA could be extracted and tested from the saliva. The class learned that polymerase chain reaction (PCR), restriction endonuclease digests, and size determination of the resulting fragments by separation on agarose gels could identify who sealed the envelope. (It turns out that the DNA came from Vince, the nefarious drumstick-wielding band member.)

In addition to the molecular techniques, the class tackled ethical issues involving use of DNA samples to identify criminals. Students debated the controversy of requiring DNA samples for forensics testing, weighing the right to privacy versus improvements in apprehending criminals.

Though many students will probably not chose science as a career, Covo acknowledges that these discussions will be important for issues that will arise in the coming years. “Better communication between scientists and the next generation may improve the knowledge of the non-scientific community regarding moral decisions that are based on scientific facts,” said Covo.



*Abdulovic-Cui is a member of the LMG DNA Fidelity Replication Group. (Photo courtesy of Steve McCaw)*



*Covo is a visiting fellow in the LMG Chromosome Stability Group. (Photo courtesy of Steve McCaw)*



*Davis is part of the LMC Chromatin and Gene Expression Group. (Photo courtesy of Steve McCaw)*





*Lowe is also a part of Chromosome Stability Group at NIEHS. (Photo courtesy of Steve McCaw)*



*Patil works in the LST Polypeptide Hormone Action Group. (Photo courtesy of Steve McCaw)*



*Stone is a member of the LMG DNA Fidelity Replication Group. (Photo courtesy of Steve McCaw)*

(Jeffrey Stumpf, Ph.D., is a postdoctoral fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

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## Remembering James Fouts

*By Eddy Ball*

The environmental health sciences community lost one of its pioneers April 15 with the death of pharmacologist and Episcopal priest James Fouts, Ph.D., at age 81.

After moving to Chapel Hill in 1970, Fouts served under former NIEHS directors Paul Kotin, M.D., and David Rall, M.D., Ph.D., as chief of the Laboratory of Pharmacology, scientific director, and senior scientific advisor prior to his retirement in 1985. He returned to NIEHS again for a few years in the 1990s as senior scientific advisor to then director Ken Olden, Ph.D.

Several people who knew Fouts during his years at NIEHS fondly remembered their colleague and friend. “Jim was a true gentleman and a scholar,” said NIEHS/NTP Director Linda Birnbaum, Ph.D., who came to NIEHS in the mid-1980s.

Former NIEHS information officer and policy analyst Tom Hawkins, who worked at NIEHS for three decades, recalled his collaboration with Fouts on a 1986 history of the Institute. “Dr. Fouts had a gift for interpreting science in clear layman’s terms, and putting the science itself in a larger perspective. I appreciated him both as a source to my work in the communications office and as a thoughtful elder in the science community.”

Fouts was one of the senior scientists, during the formative years of NIEHS, who helped set an interdisciplinary and cross-organizational tone for research into the mechanisms of toxicity in terms of mutagenesis, carcinogenesis, and teratogenesis as toxicological end points of environmental exposures, publishing more than 250 peer-reviewed

studies. He was concerned early on about the public health impacts of Superfund sites and garbage dumps, as well as the looming impact of global climate change.

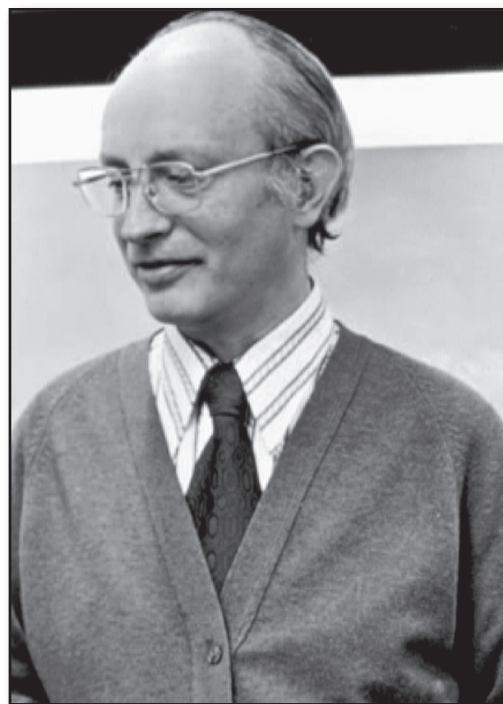
Fouts' work contributed to the creation of the International Global Climate Change Panels under the United Nations and the World Health Organization. As a recognized expert on global warming, he was one of several scientists, industry leaders, and policy makers from the United States and Russia to be invited to the 1989 Greenhouse Glasnost, hosted by actor Robert Redford in Sundance, Utah.

Trained in biochemistry and pharmacology at Northwestern University, where he received his Ph.D., Fouts enjoyed many honors for his research. His awards included the Marple-Schweitzer Memorial Award in Chemistry from Northwestern University, the Abel Award in Pharmacology from the American Society of Pharmacology and Experimental Therapeutics, and the Claude Bernard Medal from the University of Montreal.

After he left NIEHS, Fouts, who completed a Master of Divinity, summa cum laude, at Duke Divinity School in 1984, was ordained as an Episcopal priest in 1986. He spread a message of stewardship for God's creations at churches in Durham, Chapel Hill, and Franklin, N.C., up to his retirement in 2005. His obituary in the Asheville N.C. Citizen-Times described him as a gentle yet staunch environmentalist.

Fouts, who was living in Sylva, N.C., at the time of his death, is survived by his wife, Joan, children, and grandchildren. Friends and family celebrated his life in a service at St. John's Episcopal Church there April 19.

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*Following his retirement from NIEHS, Fouts, shown above in file photo taken in the 1970s, traded his cardigan and lab coat for a priestly collar and a second career as a minister. (Photo courtesy of the NIEHS Archives)*



# Science Notebook

## Hormones and the stress response

*By Robin Arnette*

According to NIEHS distinguished lecturer Ron de Kloet, Ph.D., everyday stressors induce specific physiological changes in the body. On April 12, de Kloet discussed those changes in a seminar titled “Resilience or Vulnerability to Environmental Challenge? A Question of Stress, Genes, and Balance.” John Cidlowski, Ph.D., a principal investigator in the Laboratory of Signal Transduction, hosted the talk.

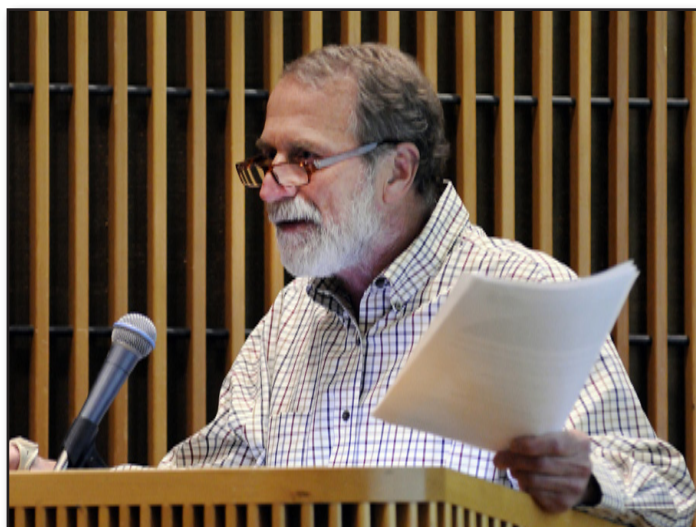
As an academy professor of the Royal Netherlands Academy of Sciences at Leiden University in the Netherlands, [de Kloet](#) studies the role glucocorticoid receptors play in the initiation and termination of a stress response. He explained that glucocorticoid receptors, when bound to their proper ligand, activate or repress genes that control tissues and organ systems within the body. De Kloet began his talk with a definition of stress.

“A stressor is a stimulus that is perceived as a disturbance of homeostasis/integrity of the individual that evokes a response,” he said. “There are physical and psychological stressors, with the most severe psychological stressor occurring when there is no information available to predict what the future brings, while evoking an uncertain anxious feeling.”

De Kloet said he found a good example of a severe psychological stress during another seminar. He asked the audience which event had the greater impact, Japan’s recent tsunami or the explosion at the Fukushima nuclear facility. Even though the tsunami produced greater devastation, 60 to 70 percent of the audience said Fukushima was worse. De Kloet said their response made sense because the majority of people are most afraid of threats that they can’t define, predict, or control.



*NIEHS was honored to have Sir Ron de Kloet on campus. He was knighted in the Netherlands by the Order of the Dutch Lion (Orde van de Nederlandse Leeuw) in 2010. (Photo courtesy of Steve McCaw)*



*Of all of the speaker’s accolades, Cidlowski was most excited about de Kloet’s academy professorship. He said of the appointment, “That’s a very distinguished award where he receives a large sum of money, and is relieved of his academic and administrative duties and allowed to pursue his research interests.” (Photo courtesy of Steve McCaw)*

## How the brain processes stress

De Kloet said that events that elicit strong emotion are remembered, and the brain's limbic system is responsible for processing this stressful information. Three major structures of the limbic system — the amygdala, hippocampus, and pre-frontal cortex — are highly interconnected, and disturbing their connectivity affects their function.

During stress, including the body's fight or flight response, de Kloet said that the autonomic nervous system becomes involved. It activates the hypothalamus-pituitary-adrenal axis, which produces hydrocortisone, a glucocorticoid hormone also known as cortisol. Normally, these elevated cortisol levels decrease after 90 minutes, but if a person fails to cope with the stress, cortisol concentrations remain high. He said prolonged exposure to cortisol may lead to several health disorders, such as heart disease, decreased bone density and muscle mass, and lowered immunity.



*NIEHS/NTP Director Linda Birnbaum, Ph.D., took copious notes during the lecture. (Photo courtesy of Steve McCaw)*

## Hormone patterns are important for health

Cortisol is important during stress, but recent research in mice, examining the secretion pattern of cortisol during basal conditions, yielded an interesting finding. De Kloet and his team found that the hormone is released in a distinct hourly pulse pattern. The pulse peaks decreased during sleep or resting periods, but as the rats aged, the amplitude, frequency, and organization of the rhythm changed. In middle-aged rats, the pulses were less pronounced, while old rats displayed a disorganized pattern.

“In the case of aging, the hormone loses its ability to coordinate and synchronize the body-brain processes in order to be prepared for stressors,” de Kloet said. “The basal hourly pulses are programmed, but stressors produce a spontaneous pulse.”

De Kloet's experiment demonstrated that these pulses are important in determining how a person will deal with stress, and that the body needs the hourly exposure to cortisol to maintain its responsiveness and resilience. He added that in the case of depression, a mental disorder in which a person is unable to cope with a stressor, the pulse pattern differs from that of a non-depressed person. A depressed person has a large amplitude of cortisol levels when they should be low.

De Kloet added that genetic, societal, and environmental influences, particularly if experienced during early life, also affect how a person tolerates stress.



*Laboratory of Reproductive and Developmental Toxicology Chief Ken Korach, Ph.D., asked a question regarding the disorganized cortisol pulse patterns in aged rats. (Photo courtesy of Steve McCaw)*



# Symposium charts impact of stress on children's environmental health

By Eddy Ball

NIEHS grantees joined colleagues in the field of children's health March 25 at Duke University to explore "The Social Context of Environmental Exposures in Children." The meeting brought together leading investigators funded by NIEHS, the U.S. Environmental Protection Agency (EPA), and other sources to share their findings and learn more about EPA's environmental justice initiative and the trans-NIH National Children's Study ([see text box](#)).

The event was the annual Duke University [Integrated Toxicology and Environmental Health Program \(ITEHP\)](#) Spring Symposium, co-sponsored by the Duke University Superfund Research Center, funded by NIEHS, and the EPA-funded [Southern Center on Environmentally Driven Disparities in Birth Outcomes \(SCEDDBO\)](#). The symposium was organized by Duke University Professor [Marie Lynn Miranda, Ph.D.](#), director of the university's Children's Environmental Health Initiative, part of the national network of Children's Environmental Health Centers, which oversees SCEDDBO, and co-facilitated by Duke University Professor [Edward Levin, Ph.D.](#), director of the ITEHP Lecture Series.

## An integrated approach to children's health

In her opening remarks, Miranda introduced an integrative paradigm that re-emerged many times during the day's presentations. "Children and pregnant mothers are sitting in the middle of a triangle, including things like host factors, ... social factors, ... and, of course, environmental factors," she told the audience.

As this paradigm strives to unite various approaches for studying children's health across disciplines, it also tries to tease out temporal connections between birth outcomes and exposures and experiences that may have taken place earlier in the mother's life, but nevertheless have a bearing on the baby's health. According to Miranda and several of the other presenters, environmental justice issues, health disparities, and the built environment — what several called the "toxic soup" — can play important roles in creating social stress that helps shape maternal health and a mother's relationship with her newborn child — and, consequentially, the child's own physical and emotional wellbeing at birth and throughout life.



*Rosalind Wright pointed to the stress domains that can imprint on long-term memory and impact maternal and child health — finances, racism and discrimination, poor housing and uncaring landlords, and community and individual violence. (Photo courtesy of Steve McCaw)*



*Messer said her work in downtown Durham has reinforced her conviction that many of the forces that determine birth outcome are largely beyond a mother's personal control. (Photo courtesy of Steve McCaw)*

## The importance of the affective domain

The first keynote presentation of NIEHS-supported research by Harvard University Professor [Rosalind Wright, M.D.](#), “Urban Asthma Paradigm: From Fragile Families to Constricting Communities,” explored the immunomodulatory effects of stress, linking stress and the development of asthma. In several major studies, Wright has explored the association of biological markers of stress, allergy, and what she called “inflammation stress domains.”

Following Wright was Duke Professor [Lynne Messer, Ph.D.](#), who described her team’s work on the Community Assessment Project (CAP) now underway in Durham, N.C. Messer argued, “Places matter to residents’ health,” and wellbeing for mother and newborn “is not just an individual-level problem.” Social stressors, such as dilapidated housing and crime, correlate strongly with such negative health outcomes as low birth weight and preterm birth.



*Miranda, center, makes a point about the influence of social environment, speaking from her seat in the audience beside two NIEHS program administrators — Annette Kirshner, Ph.D., sitting to Miranda’s left, and Kimberly Gray, Ph.D., far right. (Photo courtesy of Steve McCaw)*

## Integrating human and animal studies into the paradigm

Miranda returned to the podium to fill in for an ailing colleague with a review of SCEDDBO’s investigations, “Air Quality Across Social and Spatial Lines.” Along with geocoding birth outcomes and air quality, the SCEDDBO team of investigators has conducted clinical and animal studies of combined exposures to diesel exhaust and ozone and the influence of psychosocial stress on birth outcomes. In the mouse model experiments led by Professor [Richard Auten, M.D.](#), investigators have experimented with deprived, standard, and enriched housing as variables correlated with health endpoints.

Duke Professor [Staci Bilbo, Ph.D.](#), presented NIEHS-supported research on the fetal origins of cytokine expression in the immune response. Early-life infection, immune upregulation, maternal stress, and trauma, Bilbo argued, can prime microglia, the resident immune cells of the brain, so that they over-respond to a second hit, with enduring consequences on a child’s health.



*Levin introduced Miranda’s talk on air pollution research and other investigations by scientists in CEHI. (Photo courtesy of Steve McCaw)*

The final speaker, NIEHS grantee and Harvard Associate Professor [Robert Wright, M.D.](#), explored the synergistic effects of social stress and lead exposure on the process of brain development through synaptic plasticity modeling and pruning. Although he reported on the devastating effects of lead exposure and stress on synaptic architecture, Wright ended on a more hopeful note, as he discussed human and animal experiments that suggest enrichment interventions, given time, might have the potential to reverse many of the cognitive and behavioral deficits exhibited by lead-exposed children.





*Bilbo paused with a smile after acknowledging her collaborators in research on early-life environmental exposures that can trigger later development of dramatic hippocampal-dependent memory impairments. (Photo courtesy of Steve McCaw)*



*Robert Wright, seated with his wife and colleague Rosalind Wright, commented on parallels between Bilbo's work and his own. Both have found epigenetic alterations as a result of stress and environmental exposures. (Photo courtesy of Steve McCaw)*

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## Federal initiatives in children's environmental health

The symposium's middle session moved from reports on research to a look ahead with discussion about EPA's [EJ \[Environmental Justice\] 2014](#) initiative and progress in the National Children's Study.

Onyemaechi Nweke, Dr.PH., of the EPA Office of Environmental Justice, offered workshop attendees a backstage look at her agency's efforts to integrate EJ considerations into rule making, such as the National Ambient Air Quality Standards, to reduce disproportionate burden on communities of color and lower socioeconomic status.

While Nweke acknowledged the complex and time-consuming rulemaking process followed by EPA in setting industry-specific and performance standards, she pointed to the commitment of EPA Administrator Lisa Jackson to requiring an explicit consideration of EJ throughout the rulemaking process and asking the important question about environmental exposures — "Are there racial or economic inequalities involved?"

An audience that was interested for obvious reasons also heard a presentation on the [National Children's Study \(NCS\)](#) by Maria Lopez-Class, Ph.D., NCS Study Center Contracting Officer Technical Representative at the Eunice Shriver National Institute of Child Health and Human Development. Lopez-Class described the formative work now underway in the 31 NCS Vanguard Studies and plans for NCS sub-studies at various sites across the nation.

Along with her progress report on NCS, which is poised to launch fully in 2012, attendees listened to some welcoming news about plans to measure biological markers and self-reports of maternal stress as part of the 21-year study of child health. Such nationwide data collection could help a number of the workshop participants expand their own research into the myriad contributions to maternal stress and suboptimal birth outcomes.

# Exercise may protect the brain from chemical-induced injury

By Robin Arnette

Scientists have known for years that exercise has positive effects on human health, such as the prevention of heart disease, diabetes, and obesity, as well as promoting recovery following a brain injury as in stroke. But, recent research using mice suggests that exercise may also offer some protection against environmental toxicants and neurodegenerative diseases by reducing inflammation in the brain.

Researchers at NIEHS and the University of Alabama at Birmingham assigned adult male mice to two groups. The experimental mice had access to a running wheel, while the sedentary control mice did not. After two weeks, mice from both groups were injected with either saline or trimethyltin (TMT), an organic tin compound used to experimentally examine chemical damage to the brain.

“Even a small amount of TMT will destroy the hippocampus in the brain of a young animal, compromising its learning and memory capability,” said [Jean Harry, Ph.D.](#), principal investigator in the NIEHS Laboratory of Toxicology and Pharmacology and corresponding author on the paper.

Since TMT causes similar damage in humans and mice, Harry and her research team used TMT as a model system for studying brain injury involving neuroinflammation. According to Harry, TMT is commercially used as a plastic stabilizer, but recently, many American manufacturers have replaced TMT with other compounds, such as dimethyltin (DMT), in the production of polyvinyl chloride (PVC) tubing.

“Outside of the U.S., TMT continues to cause accidental poisoning in humans,” Harry said. “Additionally, Koichi Furuhashi, Ph.D., and his colleagues at Nagoya University Graduate School of Medicine in Japan, have shown that metabolic processes can add a methyl group to DMT to form TMT within the body, which may now raise concern about DMT exposure.”

## The role of inflammation

Twenty-four hours after the TMT injection, the control mice exhibited an increase in both anti-inflammatory and pro-inflammatory factors. They also suffered a loss of hippocampal cells known as dentate granule neurons. According to Harry, these cells are important because they serve as a gateway for a person’s experiences and short-term memory, and they are one of the few cell types that the brain continuously makes throughout a person’s life.

In contrast, the mice that used the running wheel for two weeks prior to the injection experienced significantly less brain damage, but more importantly, the levels of anti-inflammatory factors, such as interleukin-6 (IL-6) and interleukin-1 receptor antagonist (IL-1RA) increased in the hippocampus of these animals. As a result, the amount of pro-inflammatory molecules in their brains dropped dramatically. Harry said her findings support previous work from other labs that showed exercise prompts muscle and brain tissue to produce IL-6, which turns off tumor necrosis factor-alpha (TNF-alpha), a major pro-inflammatory signal. Her research is the first demonstration that IL-6 production serves to prevent neuronal damage with exercise.



*Harry said that in terms of inflammation, her studies show that the brain and the rest of the body are not separated, but seem to work together. (Photo courtesy of Steve McCaw)*



She explained the outcome this way: “If cell death occurs in the brain as a result of chemical exposure, neuroinflammation is a likely result. But, exercise can diminish this effect by producing molecules that repress this signal and possibly prevent neuronal death or promote repair.”

### Workouts may alleviate neural disorders

Harry added that TNF-alpha levels rise with any inflammatory event in the body, for example, in the case of rheumatoid arthritis. In the brain, however, this process is highly regulated. Since neuroinflammation is a component of many neurodegenerative disorders, such as Alzheimer’s disease, Parkinson’s disease, and autism, she believes the combination of exercise physiology and neuroscience research may allow investigators to identify new pathways and treatments that regulate the good and bad aspects of neuroinflammation.

Harry mentioned another exciting finding from her studies — the relatively brief span it took to see results from the exercise. “These are normal young adult animals, and two weeks of exercise on a running wheel is a short time for an exercise model. Most of them require four to five weeks, so we’re showing a significant physiological change in an abbreviated period of time.”

*Citation:* Funk JA, Gohlke J, Kraft AD, McPherson CA, Collins JB, Harry GJ. 2011. Voluntary exercise protects hippocampal neurons from trimethyltin injury: Possible role of interleukin-6 to modulate tumor necrosis factor receptor-mediated neurotoxicity. Brain Behav Immun; doi:10.1016/j.bbi.2011.03.012 [Online 22 March 2011].

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## NTP Peer Review Panel weighs in on Aloe vera extract, other compounds

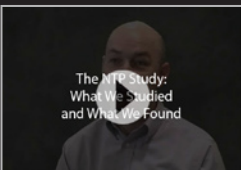
By Ernie Hood

Don’t throw out the aloe plant you keep to treat burns, but it might be time to reconsider if you consume certain commercial products containing Aloe vera, such as drinks, concentrates, capsules, powders, and flavorings.

In its April 5, 2011 meeting at NIEHS, the NTP Technical Reports Peer Review Panel agreed with the conclusions reached from two-year drinking water bioassays in rats and mice as presented in the [draft NTP Technical Report](#), which said, “There was clear evidence of carcinogenic activity of a non-decolorized whole leaf extract of Aloe vera in male and female F344/N rats based upon increased incidences of adenomas and carcinomas of the large intestine.” *Clear evidence* is the highest designation in the four-point scale used by NTP to characterize levels of evidence for carcinogenic activity in the substances it evaluates.



Committee Chair John Cullen, V.M.D., Ph.D., right, of North Carolina State University, and NTP Deputy Program Director for Science Nigel Walker, Ph.D., listened intently to one of the scientific presentations briefing the panel on the draft Technical Reports. (Photo courtesy of Steve McCaw)





The NTP Study:  
What We Studied  
and What We Found

**Linked video:**

[In a series of videos, Nigel Walker, Ph.D., NTP Deputy Program Director for Science, discusses Aloe vera and the NTP draft Technical Report](#)

(Launches in new window)

Download Media Player:  Quicktime 

While previous NTP studies of [dermal exposures](#) to Aloe vera in mice did not find a strong link with skin cancer, these newer studies showed that exposure via chronic ingestion in the water was associated with a high incidence of colon cancer in the rat. The rat colon cancer shared morphological and molecular features with human colon cancer, the fourth most commonly diagnosed cancer and the second-leading cause of cancer-related deaths of people in the United States. In its oral form, Aloe vera is commonly marketed as an “herbal remedy” that is claimed to alleviate a variety of conditions, including cancer, arthritis, constipation, and gastrointestinal disorders. Since the Aloe vera extract is a dietary supplement, it has not been subjected to the same U.S. Food and Drug Administration (FDA) regulations as apply to drugs.

In collaboration with the FDA’s National Center for Toxicological Research (NCTR), the NTP studied the non-decolorized extract processed from the whole leaf of the plant. That extract contains an anthraquinone called aloin, which may give the plant its laxative qualities. Some anthraquinones have previously been shown to be carcinogenic. Many commercial preparations, it should be noted, run the whole leaf extract through a filtration process, decolorizing it and removing much of the aloin. However, according to the nomination of Aloe vera to the NTP testing process by the National Cancer Institute, the non-decolorized extract is still widely available, leading to potentially widespread exposure to aloin in the U.S. population.

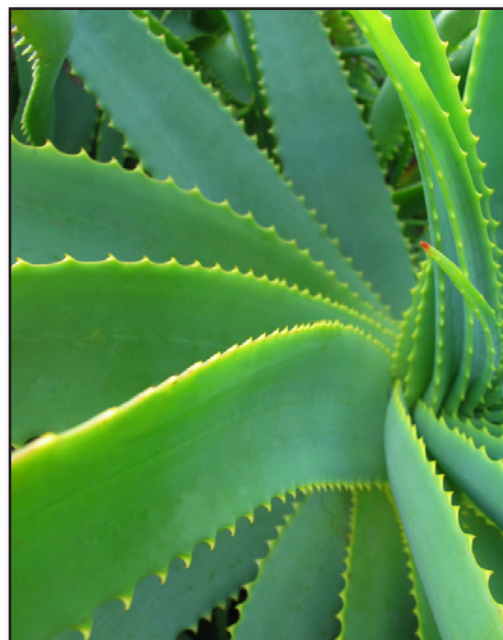
The panel also agreed with the [draft Technical Report](#) conclusions reporting *clear evidence of carcinogenic activity* in male and female mice and rats exposed to acrylamide in drinking water, with tumors formed at multiple sites. [Acrylamide](#) is a chemical widely used in the manufacturing of papers, dyes, and other industrial products. It can be formed when certain foods are cooked at high temperatures, such as potatoes and grains processed to make French fries, toast, or potato chips. Cigarette smoke also contains acrylamide. To aid in its risk assessment concerning the compound, including potential actions to reduce human exposures, it was nominated by the FDA’s Center for Food Safety and Applied Nutrition for study by the NTP and NCTR.

Finally, the panel also concurred with draft Technical Report conclusions on two other reports: [toxicology and carcinogenesis studies of senna](#), the active ingredient in frequently used over-the-counter laxatives and also as a flavoring agent, and toxicology and carcinogenesis studies of transplacental exposure of several antiretroviral agents used singly or in combination to treat HIV.

The reviewers agreed that there was *no evidence of carcinogenic activity* of senna in the transgenic mouse models exposed to the compound. They also agreed with the variety of conclusions reached regarding transplacental exposures in mice to the drugs



*Mary Boudreau, Ph.D., NCTR study scientist for the Aloe vera technical report, briefed the Peer Review Panel on the toxicology and carcinogenesis studies of Aloe vera administered in drinking water to rats and mice. (Photo courtesy of Steve McCaw)*



*There are at least 420 different plant species of Aloe. Aloe vera specifically refers to the Aloe barbadensis Miller plant, which is the most common form used in Aloe-based products. An organic component in the outer leaf pulp of Aloe leaves, known as the latex, contains aloin. (Photo courtesy of NIEHS stock)*



3'-azido-3'-deoxythymidine (AZT), lamivudine (3TC), nevirapine (NVP), and nelfinavir nesylate (NFV). AZT was tested singly, in combination with 3TC, and both were used in combination with NVP or NFV, reflecting current “cocktail” HIV therapies. Among these combinations, there was *some evidence of carcinogenic activity* in male mice exposed to the mixture of AZT, 3TC, and NVP.

(Ernie Hood is a contract writer for the NIEHS Office of Communications and Public Liaison.)

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*Families can reduce their exposure to acrylamide by adopting a healthy, balanced eating plan that includes fruits and vegetables, lean meats, fish, and high-fiber grains. (Photo courtesy of NIEHS stock)*

## Economist models effects of global climate change

*By Melissa Kerr*

As the earth's temperature continues to rise, scientists are racing to understand how the change can affect human health. NIEHS [grantee](#) Olivier Deschenes, Ph.D., spoke at NIEHS April 7 as part of the Keystone Science Lecture Seminar Series, to discuss his research on this topic. He presented “Health Impacts of Climate Change: Evidence from India and the United States,” during a talk hosted by NIEHS Health Scientist Administrator Caroline Dilworth, Ph.D.

[Deschenes](#) is an associate professor in the Department of Economics at the University of California, Santa Barbara (UCSB), as well as a research associate with the National Bureau of Economic Research. One of his primary [areas of interest](#) is environmental and resource economics.

### Climate change modeling

Deschenes used the Community Climate System Model (CCSM) and the Hadley Centre for Climate Prediction and Research ocean-atmosphere general circulation model version 3 (HadCM3) to help predict how rising temperatures might affect the general population in coming decades. The CCSM is a four-component framework for building and testing various climate models and is maintained by the National Center for Atmospheric Research to analyze past, present, and future global climate data.

The HadleyCM3 model is the most recent climate model in use at the Hadley Center, which is part of the British Atmospheric Data Centre (BADC). The BADC provides atmospheric data for scientists and researchers. HadleyCM3 was one of the major models used in the Intergovernmental Panel on Climate Change Third Assessment Report in 2001.



*Deschenes teaches courses at UCSB on econometrics and climate change in terms of economics and policy. (Photo courtesy of Steve McCaw)*

As Deschenes explained, the human body's threshold in relation to air temperature is a per day mean of around 90 degrees Fahrenheit (F). When the body experiences the added stress of extreme temperature regulation, there are also additional demands on the cardiovascular and respiratory systems.

### Number of extreme weather events to rise

"Historically, the average person in the U.S. is exposed to one day a year where the mean temperature exceeds 90 degrees F," Deschenes explained. Using the climate change models, it is predicted that by the end of the century, the average person will be subject to about 60 such days.

Even at the present time, Deschenes stressed, "The wellbeing and the health of the vast majority of the world's population are significantly affected by extreme weather events." With the added effects of climate change, the conditions could become even more potentially harmful for vulnerable populations.

### Impacts of climate change on U.S. and India

Changes to the earth's climate may have dramatic effects, but how to glean information empirically was challenging. Deschenes wanted to understand the extent to which extreme temperature stress affects human health, the defensive and adaptive behaviors of individuals, the mechanisms linking physiological effect, and the implications for potential health cost. Using the available data from the U.S. and India, he was able to answer many, but not all, of these questions for both countries.

For his studies in the U.S., Deschenes used mortality rates because there was significant geographical variation and a long time series of data available. His prediction of mortality rates, in conjunction with the climate change models, produced some grim possible scenarios ([see text box](#)).

Deschenes claimed this prediction is more of a troublesome issue in India than in the U.S., because India is growing faster. "There is cause for great concern," he concluded.

(Melissa Kerr studies chemistry at North Carolina Central University. She is currently an intern in the NIEHS Office of Communications and Public Liaison.)



*Dilworth administers the NIEHS grant to Deschenes, "Using Medication Purchases to Measure the Health Consequences of Air Pollution." (Photo courtesy of Steve McCaw)*



*NIEHS Senior Advisor John Balbus, M.D., was in the audience at Deschenes' talk. The presentation inspired several questions from Balbus about the models and the results. (Photo courtesy of Steve McCaw)*



## A tale of two countries and climate change

Deschenes' findings reflect the geographic, demographic, and economic differences between the U.S. and India and underscore the notion that climate change will have more impact on people in developing countries.

“By the end of the century, climate change will lead to 64,000 more deaths per year in the U.S. — about a 3 percent increase compared to the average annual mortality rate,” Deschenes explained.

Deschenes' research took into account the concept of adaptation through energy use, as well as other changes in health-related welfare costs. He used climate change data to estimate indirect health costs in relation to climate change. Among those costs, the data projects a 15 to 30 percent — about \$15 billion to \$35 billion — increase in residential energy consumption in the US.

In India, where the population is highly dependent on agriculture, the implications of climate change have greater potential impact. The data showed an interesting distinction between rural and urban populations that was not evident in the data from the US.

“The rural population, their well being, their health, is much more exposed to temperature extremes than the urban population,” Deschenes said, and it is less likely to have the means to cope as effectively with the extremes.

Compared to the single day per year exposure of someone in the US to a 90-degree day, the average in India is currently 33 days. The data projecting the effects of climate change by the end of the century forecast an increase in the mortality rate in India of 10 to 50 percent. However, Deschenes found an insignificant change among urban populations of India. Almost all of the change in data projecting to the end of the century related to rural populations.

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## Protecting telomeres involves HipHop protein

*By Jeffrey Stumpf*

Geneticist [Yikang Rong, Ph.D.](#), a senior investigator at the National Cancer Institute, presented evidence during an April 11 talk at NIEHS that explained models for maintaining telomeres in the fruitfly, *Drosophila melanogaster*. Rong's presentation, part of the Laboratory of Molecular Genetics (LMG) trainee-invited seminar series, discussed the role of the novel protein HipHop in telomere maintenance in somatic and sperm cells.

Telomeres are the ends of chromosomes that protect the integrity of DNA within the chromosomes. Loss of telomeres causes fusion of chromosome ends by DNA repair proteins, triggering cell death. To prevent telomere loss, two processes are important: the elongation of the chromosome ends — by telomerase in humans — and capping of the ends to prevent their immediate degradation.

Unlike many organisms, *Drosophila* does not use specific sequences to mark the location for capping telomeres, but rather can cap telomeres at any DNA double-strand break, creating new telomeres. However, the requirement for sequence-specific capping could be a misleading difference because, as Rong pointed out, the mechanism of telomere capping may be similar throughout eukaryotes. “I have no problem believing that at

the end of the day, organisms cap telomeres in the same way,” Rong speculated. “It doesn’t seem reasonable to have to reinvent the wheel.”

*Drosophila* offers enormous advantages in studying telomere biology, because telomere elongation and end capping are naturally uncoupled and can be studied separately. Also, *Drosophila* genetics has been widely used for studying many pathways in developmental and cell biology. Rong is responsible for further empowering *Drosophila* geneticists with his important contributions to developing gene targeting methods for site-specific mutations in *Drosophila*.

LMG Visiting Fellow [Hemakumara Mutra, Ph.D.](#), who hosted Rong’s visit to NIEHS, also studies telomeres in *Drosophila*. He notes that, like *Drosophila*, cancer cells lack telomerase and can escape from cell death using alternate telomere lengthening mechanisms. “Studying telomere length homeostasis in *Drosophila* will give us insight into the telomere length maintenance during disease conditions in humans,” said Mutra.

### The proteins at the ends justify the means

The structure of telomere caps in *Drosophila* is poorly understood. Rong’s strategy was to search for proteins that bind to telomere targeted proteins, called HP1 and HOAP, leading to the identification of HipHop. Similar to HOAP, reducing HipHop levels in *Drosophila* causes loss of telomeres, as evidenced by chromosome fusions.

Although HipHop and HOAP could be detected at telomeres, it is difficult to resolve how close to the ends the proteins bind, because the end of the chromosome contains repeated sequences. Rong’s group cleverly engineered flies whose telomeres were closer to the centromere in regions where the sequence was not repeated. These experiments demonstrated a region 11 kilobases from the end to which the telomeric proteins bind, regardless of the sequence.

### Sperm telomeres are maintained by HipHop’s distant cousin

In the *Drosophila melanogaster*, there is a gene duplication of *hiphop* called *k81*, which has testis-specific expression. Male mutants of *k81* are sterile but not because they make defective sperm. Sperm from *k81* mutants are functional, but resulting embryos die immediately after fertilization and exhibit chromosome fusions.

HipHop and K81 have similar sequences allowing K81 to be able to substitute for HipHop, although the opposite is not true. Rong’s group mapped the crucial stretch of four amino acids that differ between the two proteins and are necessary for K81 function.

Rong explained the model that *k81* marks the location of telomeres during sperm formation. The paternal genome must be repackaged after fertilization and requires *k81* to prevent the embryo from processing



Rong answered questions from the many interested NIEHS researchers. Rong is head of the NCI Eukaryotic Genome Maintenance Unit. (Photo courtesy of Steve McCaw)



Mutra moderated questions for Rong’s seminar. Mutra represented fellow LMG postdoctoral trainees in hosting Rong’s visit to NIEHS. (Photo courtesy of Steve McCaw)



telomeres as normal double strand breaks. This epigenetic marking of DNA is a novel mechanism of repackaging paternal genomes and may contribute to the understanding of male fertility.

(Jeffrey Stumpf, Ph.D., is a postdoctoral fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

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## Diet may protect against colon cancer, says NIEHS study

*By Ed Kang*

Consuming meat cooked at high temperatures can cause DNA damage in the colon, whereas eating certain other foods may have a protective effect, according to a recent study from the Laboratory of Molecular Carcinogenesis (LMC) and the Epidemiology Branch at NIEHS. The study titled “Inhibition of Fried Meat-Induced Colorectal DNA Damage and Altered Systemic Genotoxicity in Humans by Crucifera, Chlorophyllin, and Yogurt” was published online in the journal PLoS ONE and is the result of a 4-week controlled feeding study of 16 volunteers.

The researchers explain that cooking meat at a high temperature (250°C versus 100°C) increases levels of carcinogens that are present in well-done, highly fried or burned meat. The study examined whether the negative effects of consuming this meat could be mitigated by a diet of yogurt, chlorophyllin (a derivative of chlorophyll), and cruciferous vegetables, such as green or red cabbage, broccoli, Brussels sprouts, and cauliflower.

“It’s clear that cooking meat at a high temperature creates a large number of mutagens that contribute to DNA damage to colon cells,” said lead author Dan Shaughnessy, Ph.D., who conducted the study while a postdoctoral fellow in the LMC. “But eating certain foods can reduce the damage and possibly the risk for cancer.”

Colorectal cancer is the fourth most common cancer worldwide, and increased risk is associated with elevated levels of mutagenic compounds known as heterocyclic amines (HCAs). HCAs are formed when meats are cooked at high temperature, particularly by pan frying.

The cruciferous vegetables, chlorophyllin tablets, and yogurt containing lactobacilli were chosen based on previous studies showing their antimutagenic effects against the damage from HCAs, thus modulating cancer risks associated with meat consumption. The NIEHS study goes a step further by concurrently measuring urinary and fecal mutagenicity and DNA damage in the colon, and by demonstrating that dietary antimutagens can alter these characteristics.

“Although increased mutagenicity following consumption of highly fried meat is well established, to our knowledge, this is the first study to show that dietary factors can reduce DNA damage specifically in the colon,” explained Jack Taylor, M.D., Ph.D., co-author and head of the LMC Molecular and Genetic Epidemiology Group. “The inhibitor diet decreased nearly twofold the DNA damage in colorectal cells.”



*Lead author Dan Shaughnessy is now a program administrator in the Susceptibility and Population Health Branch of the NIEHS Division of Extramural Research and Training. (Photo courtesy of Steve McCaw)*

Although the study points to encouraging results, the investigators are quick to identify the need for further research. The authors caution that testing the effects of the three dietary factors together, rather than separately, limits conclusions about the relative importance of each dietary antimutagen and the mechanism of DNA-damage inhibition. Future studies may further evaluate the protective mechanisms and reveal any synergistic or even antagonistic relationship among the dietary antimutagens.

Participants were enrolled and studied at the University of North Carolina at Chapel Hill. Samples were analyzed at NIEHS, the U.S. Environmental Protection Agency, and the Lawrence Livermore National Laboratory.

*Citation:* Shaughnessy DT, Gangarosa LM, Schliebe B, Umbach DM, Xu Z, MacIntosh B, Knize MG, Matthews PP, Swank AE, Sandler RS, DeMarini DM, Taylor JA. 2011. Inhibition of Fried Meat-Induced Colorectal DNA Damage and Altered Systemic Genotoxicity in Humans by Crucifera, Chlorophyllin, and Yogurt. PLoS ONE 6(4):e18707. doi:10.1371/journal.pone.0018707

(Ed Kang is a public affairs specialist in the Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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## This month in EHP

By Eddy Ball

The May issue of [Environmental Health Perspectives \(EHP\)](#) highlights a longstanding threat to water quality with a cover story on “Phosphorus Paradox: Scarcity and Overabundance of a Key Nutrient.” The story explores the paradoxical dilemma that even as access to phosphate rock dwindles, far too much phosphorus is ending up in waterways.

A second news feature, “Tools for Tracking Antibiotic Resistance,” examines efforts by governments and agencies to protect the efficacy of medically important antibiotics through a variety of monitoring and educational strategies.

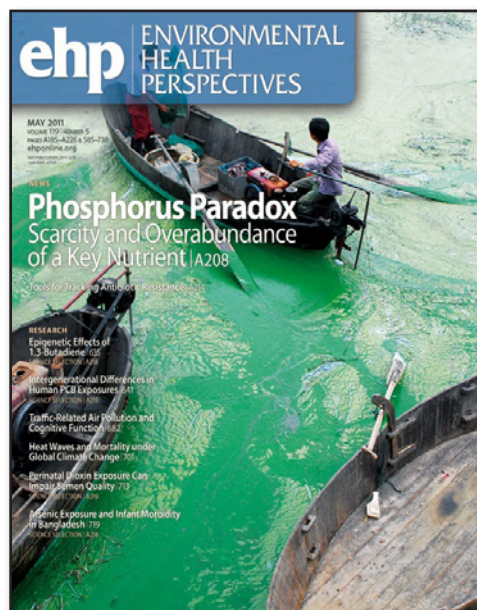
In this month’s [Researchers’ Perspective](#) podcast, University of California investigators Tracey Woodruff, Ph.D., and Rachel Morello-Frosch, Ph.D., discuss with series host Ashley Ahearn the major ethical and logistical dilemmas involved in communicating chemical body burdens to participants in studies.



Taylor was principal investigator on the new study. (Photo courtesy of Steve McCaw)



<http://twitter.com/ehponline>





NTP lead scientist Kristina Thayer, Ph.D., and Associate Director John Bucher, Ph.D., contribute an editorial in this issue on the newly formed NTP Office of Health Assessment and Translation. The new office replaces the novel NTP Center for the Evaluation of Risks to Human Reproduction (CERHR), founded in 1998 and currently directed by Thayer, and reflects the evolution of CERHR into the NTP focal point for the thoughtful and deliberative integration of relevant information of all types in health assessments for the protection of public health.

Featured studies this month include the following:

- Epigenetic Effects of 1,3-Butadiene
- Intergenerational Differences in Human PCB Exposures
- Traffic-Related Air Pollution and Cognitive Function
- Heat Waves and Mortality under Global Climate Change
- Perinatal Dioxin Exposure Can Impair Semen Quality
- Arsenic Exposure and Infant Morbidity in Bangladesh

EHP also continues into May its month-long celebration of Earth Day with a [special page](#) published April 22. The page features a compilation of recent EHP news features, perspectives, commentaries, reviews, science education lessons, and podcasts centered around Earth Day themes ([see related story](#)).

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## Extramural papers of the month

*By Jerry Phelps*

- [Beijing Olympics pollution controls could save lives](#)
- [Amyloid-binding compound extends lifespan in \*C. elegans\*](#)
- [Study finds no link between mercury exposure and cardiovascular disease](#)
- [Mitochondrial, but not nuclear ligase3 is required for cellular viability](#)



Read the current Superfund Research Program [Research Brief](#). New issues are published on the first Wednesday of each month.

## Beijing Olympics pollution controls could save lives

A study supported by the NIEHS Superfund Research Program found that the air pollution control measures put in place in Beijing during the 2008 Olympic Games would cut the lifetime risk of lung cancer almost in half. If the controls were continued, polycyclic aromatic hydrocarbon (PAH) pollution from combustion would drop dramatically and could translate to about 10,000 fewer lifetime cases of lung cancer.

The research found that in Beijing, a metropolitan area with 22 million people, the existing level of PAH pollution would lead to about 21,200 lifetime cases of lung cancer, but that would drop to 11,400 cases if pollution controls similar to those imposed during the 2008 Olympics were sustained.

China is now the leading emitter of PAH pollutants in the world. According to the study “PAH pollution was definitely reduced by the actions China took during the 2008 Olympics, such as restricting vehicle use, decreasing coal combustion, and closing some pollution-emitting factories.”

Some, but not all, of the steps taken during the Olympics have been continued; however, the number of vehicles in Beijing, for instance, is continuing to increase 13 percent a year, the report noted. “Controlling vehicle emissions is key to reducing the inhalation cancer risks due to PAH exposure in Chinese megacities,” the researchers wrote in their study.

*Citation:* Jia Y, Stone D, Wang W, Schrlau J, Tao S, Simonich SL. 2011. Estimated reduction in cancer risk due to PAH exposures if source control measures during the 2008 Beijing Olympics were sustained. Environ Health Perspect; doi:10.1289/ehp.1003100 [Online 8 Feb 2011].

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## Amyloid-binding compound extends lifespan in *C. elegans*

NIEHS-supported researchers report that a chemical dye that lights up amyloid protein clumps characteristic of Alzheimer’s disease also slows aging in the nematode, *C. elegans*. The lifespan-boosting effects of the dye — called Thioflavin T (ThT) or Basic Yellow 1 — support the idea that the build-up of misshapen proteins is one of the fundamental events in the aging process. Drugs that stimulate the cell’s natural repair and protein-recycling systems could be used to treat diseases of old age.

The study results show that small doses of Thioflavin T boosted the lifespan of roundworms by as much as 78 percent. Worms that did not receive the dye were all dead within 20 days, yet more than 80 percent of worms consuming a diet that included an optimum dose of ThT were still alive after the same period. ThT proved toxic at higher doses and shortened the worms’ lives considerably.

The study authors suspect that ThT boosts lifespan by recognizing all kinds of toxic protein clumps. The dye reversed the effects of mutations that cause muscle proteins to misfold, and to become paralysed at a particular temperature. The team also found that worms that lack genes important to dealing with misshapen proteins do not live longer when fed Thioflavin T.

*Citation:* Alavez S, Vantipalli MC, Zucker DJ, Klang IM, Lithgow GJ. 2011. Amyloid-binding compounds maintain protein homeostasis during ageing and extend lifespan. Nature 472(7342):226-229.

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## Study finds no link between mercury exposure and cardiovascular disease

New research findings published by NIEHS grantees show no evidence that higher levels of mercury exposure are associated with higher risk for cardiovascular disease or stroke. Previous research has shown the beneficial cardiovascular effects of eating fish rich in omega-3 fatty acids, but other studies suggested that mercury exposure from fish consumption might be linked to higher risk of cardiovascular diseases. The current findings may allay those fears.



The researchers analyzed data from two studies, which included more than 170,000 men and women. Participants in both groups have answered questions every two years about their medical history, risk factors, disease incidence, and lifestyle. For the current analysis, the researchers measured mercury concentrations in stored toenail clippings in nearly 7,000 participants who did and did not experience a cardiovascular event during follow-up. Toenail mercury concentrations are an excellent biomarker of long-term mercury exposure. The researchers identified 3,427 new cases of coronary heart disease and stroke and matched them to 3,427 randomly chosen participants free of cardiovascular disease during follow-up.

After adjusting for age, gender, and other cardiovascular disease risk factors, the researchers found no association between mercury exposure and higher risk of cardiovascular disease. Trends toward lower risk with higher mercury levels were actually seen, which the researchers attribute to other beneficial effects of fish consumption.

*Citation:* Mozaffarian D, Shi P, Morris JS, Spiegelman D, Grandjean P, Siscovick DS, Willett WC, Rimm EB. 2011. Mercury exposure and risk of cardiovascular disease in two U.S. cohorts. *N Engl J Med* 364(12):1116-1125.

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## Mitochondrial, but not nuclear ligase3 is required for cellular viability

A multi-institutional team of scientists including former NIEHS Principal Investigator Ben Van Houten, Ph.D., has determined that mitochondrial DNA ligase III (Lig3), an enzyme involved in various DNA repair pathways, is necessary for cellular growth and viability, while nuclear Lig3 is not required for cell survival. These findings were made through a series of exquisite experiments that incorporated various forms of the gene coding for Lig3 in mouse embryonic stem cells.

Previous research has demonstrated the importance of the nuclear complex Lig3 and its partner protein Xrcc1 in DNA single-strand break repair. The full characterization of Lig3 has been hampered by the fact that deletion of its gene is embryonically lethal in mice. In the current studies, the investigators introduced various forms of Lig3 into mouse embryonic stem cells containing a conditional allele for Lig3 that could be deleted with Cre recombinase. This approach enabled them to determine that mitochondrial Lig3, but not nuclear, is necessary for cell viability. They also found that substitution of Lig1 for Lig3 in the mitochondria maintains cellular viability.

*Citation:* Simsek D, Furda A, Gao Y, Artus J, Brunet E, Hadjantonakis AK, Van Houten B, Shuman S, McKinnon PJ, Jasin M. 2011. Crucial role for DNA ligase III in mitochondria but not in Xrcc1-dependent repair. *Nature* 471(7337):245-248.

(Jerry Phelps is a program analyst in the NIEHS Division of Extramural Research and Training.)

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# Intramural papers of the month

*By Mamta Behl, Archana Dhasarathy, and Angelika Zaremba*

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## Physiological key player found for glucose-induced insulin secretion

NIEHS researchers, in collaboration with scientists from the University of California, Los Angeles David Geffen School of Medicine, have identified the G(o2) protein as a physiological key player in the control of glucose-induced insulin secretion by pancreatic beta cells. The finding may lead to better treatments for diabetic patients managing their insulin levels.

Insulin secretion by pancreatic beta cells is highly regulated, with G proteins controlling the output of insulin in response to physiological demands. Any malfunction in the system can lead to diabetes mellitus. *Bordetella pertussis toxin* (PTX) has been known to stimulate insulin release from pancreatic beta cells for nearly 30 years. However, the exact molecular target of PTX has not been identified. There are five different nonsensory G(i) or G(o) proteins upon which PTX could act to stimulate insulin release. These proteins displayed extensive homology and are functionally similar. Members of the research team used mouse model knockouts and determined that G(o2) was the target G protein responsible for the increased insulin release after PTX treatment.

The components in G protein signaling pathways and their downstream effectors have been a rich source of targets for pharmaceuticals. Identifying key players in this complex process will direct future investigations to improve the treatment of abnormal insulin secretion such as in diabetes mellitus.

*Citation:* Wang Y, Park S, Bajpayee NS, Nagaoka Y, Boulay G, Birnbaumer L, Jiang M. 2011. Augmented glucose-induced insulin release in mice lacking G(o2), but not G(o1) or G(i) proteins. *Proc Natl Acad Sci U S A* 108(4):1693-1698.

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## Dioxin targets the blood-brain barrier

Environmental toxicants, such as dioxins, have long been known to affect the liver, but new research from NIEHS suggests these chemicals may act through the aryl hydrocarbon receptor (AhR) to alter the way that the blood-brain barrier handles therapeutic drugs. One such toxicant, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), increased the production of P-glycoprotein in rat brain capillaries. P-glycoprotein is an ATP-driven drug efflux pump that functions as a gate-keeper for the brain, limiting entry of both neurotoxicants and therapeutic drugs.

The researchers found that in addition to increasing P-glycoprotein expression, TCDD increased the transport activity of two other efflux pumps — multidrug resistance-associated protein 2 and breast cancer resistance



polypeptide. The study also demonstrated that TCDD increased expression of two classical AhR target genes, Cyp1a1 and Cyp1b1, which code for enzymes that metabolize certain foreign chemicals.

Finally, the authors demonstrated that in TCDD-dosed rats, brain accumulation of the drug and P-glycoprotein substrate verapamil, was reduced. This work provides a mechanism by which dioxins may reduce the ability of drugs to enter the central nervous system, thus making it more difficult to treat disease.

*Citation:* [Wang X](#), [Hawkins BT](#), [Miller DS](#). 2011. Aryl hydrocarbon receptor-mediated up-regulation of ATP-driven xenobiotic efflux transporters at the blood-brain barrier. *FASEB J* 25(2):644-652.

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## Comparison of global gene expression profiles in response to xenoestrogens

NIEHS investigators have published a study comparing the activity and responses of two xenoestrogenic compounds, bisphenol A (BPA) and 2,2-bis(p-hydroxyphenyl)-1,1,1-trichloroethane (HPTE). The research will help other scientists assess patterns of response and molecular mechanisms of potentially estrogenic chemicals.

Since BPA and HPTE are known to interact with estrogen receptor alpha (ERalpha), an important nuclear receptor that modulates estrogen-dependent gene expression, the authors developed a mouse uterine model system to study the direct targets of estrogenic compounds. They used microarray gene expression profiling to compare uterine responses following the addition of estrogens E2 or E3, BPA, or HPTE, for 2 or 24 hours. Both BPA and HPTE induced cell proliferation, but not to the same extent as estrogen.

When compared to E2, BPA and HPTE were able to elicit early, but not late stage gene expression changes, a pattern similar to the weak estrogen E3. In addition, using mice carrying a DNA-binding mutant of ERalpha, the authors show that the “tethered response mechanism” of estrogen receptor is sensitive to xenoestrogens, as BPA and HPTE elicited the same responses as E2.

BPA is widely used in plastics, and HPTE is a metabolite of the pesticide methoxychlor, thus raising concerns over their negative impact on human health. This study provides a useful model to test potential estrogenicity and mode of response of other xenoestrogenic compounds.

*Citation:* [Hewitt SC](#), [Korach KS](#). 2011. Estrogenic activity of bisphenol A and 2,2-bis(p-hydroxyphenyl)-1,1,1-trichloroethane (HPTE) demonstrated in mouse uterine gene profiles. *Environ Health Perspect* 119(1):63-70.

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## Study highlights importance of protein complexes in liver metabolism

Researchers from NIEHS found that the Med25 protein was important in helping hepatocyte nuclear factor 4alpha (HNF4alpha) direct gene expression. HNF4alpha is a nuclear receptor that functions in regulating gene expression in the liver, kidney, pancreas, and intestines. This report is the first to identify Med25, a variable member of the mediator complex, as a new coactivator for HNF4alpha.

Using various biochemical approaches, the authors detected Med25 as an HNF4alpha interacting protein. They showed that Med25 helped HNF4alpha activate certain genes by converting the HNF4alpha bound transcriptional complex from the inactive to the active state, facilitating the recruitment of RNA polymerase II to the promoter site. At the molecular level, Med25 increases the association of HNF4alpha with proteins that help activate genes, such as the Mediator complex, coactivators, and RNA polymerase II. The authors also showed that Med25 interaction with HNF4alpha gives HNF4alpha an exquisite specificity in controlling those genes that are responsible for lipid and drug metabolism in human liver cells.

Mutations of HNF4alpha have been linked to diabetes, liver metabolic diseases, and impaired drug metabolism. This study highlights one cofactor, Med25, which confers selectivity in targeting HNF4alpha activation of distinct gene targets.

*Citation:* [Rana R, Surapureddi S, Kam W, Ferguson S, Goldstein JA](#). 2011. Med 25 is required for RNA polymerase II recruitment to specific promoters, thus regulating xenobiotic and lipid metabolism in human liver. *Mol Cell Biol* 31(3):466-481.

(Mamta Behl, Ph.D., is a research fellow in the NIEHS Toxicology Branch. Archana Dhasarathy, Ph.D., is a postdoctoral fellow in the NIEHS Laboratory of Molecular Carcinogenesis Eukaryotic Transcriptional Regulation Group. Angelika Zaremba, Ph.D., is a visiting fellow in the NIEHS Laboratory of Signal Transduction Inositol Signaling Group.)

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# Inside the Institute

## Fellows urged to nurture careers

By Eddy Ball

Trainees gathered April 19 in Rodbell Auditorium for the annual [NIEHS Trainees Assembly \(NTA\)](#) General Assembly Meeting, moderated by NTA Steering Committee Co-chair Nisha Cavanaugh, Ph.D., an IRTA fellow in the NIEHS DNA Repair and Nucleic Acid Enzymology Group.

The event served as an orientation for new trainees and updated returning fellows on career and networking opportunities sponsored by the NTA and NIEHS Office of the Scientific Director. The meeting also featured talks by NIEHS/NTP Director Linda Birnbaum, Ph.D., Acting Scientific Director [David Miller, Ph.D.](#), and Director of the [Office of Fellows Career Development \(OFCD\)](#) Diane Klotz, Ph.D., about their own experiences negotiating what often seemed to be labyrinthine career paths.

### Focus on flexibility and communication

As the lead speaker, Birnbaum set the tone for meeting with her account of the first few years following her completion of a doctorate in microbiology that led, by twists, turns, and serendipity, to a fellowship in pharmacology and toxicology at NIEHS, as well as a tenured position at the Institute during the mid-1980s. Birnbaum joked about what must have been, at the time, very challenging interruptions in her career and shared advice with the trainees about developing communications skills to further their scientific training.

“Any opportunities you have to improve your writing, I urge you to take them,” Birnbaum told her audience. “And the other area where I would urge you to take advantage of opportunities [during your fellowship] is oral communications.”

With a slide of himself wearing a soiled lab coat at his rustic lab circa 1975 filling the screen behind him, Miller made some of the same points. Miller recounted, often tongue-in-cheek, his zigzag journey from bird studies as a postdoc in Maine to his current role leading the NIEHS Division of Intramural Research.

“I don’t think I planned any of this,” Miller said of his career and the high-profile papers that attracted job offers. “One of the things that I discovered early on as I worked on these manuscripts,” he added, “was the fact that I could write. Just as Linda said earlier, writing is a critical skill. I urge my postdocs to write a lot, then get somebody to criticize it.”



*Birnbaum flavored her talk with humor, as she urged trainees to take advantage of training in leadership, an important skill both for running their own labs and for motivating collaborators and colleagues. (Photo courtesy of Steve McCaw)*



*Miller joked that important transitions in his career turned out to involve following long-time friend and former Acting Scientific Director John Pritchard, Ph.D. In his postdoc at a marine biology lab, Miller succeeded Pritchard, who in 1985 recruited Miller to NIEHS. (Photo courtesy of Steve McCaw)*



## Events and opportunities

With the NIEHS Biomedical Career Fair just ten days away, planning committee co-chair Emily Zhou, Ph.D., called for trainees to fill the remaining open volunteer positions at the event and described the how-to emphasis in this year's fair. As Zhou explained, in addition to a keynote talk, workshops and career panel discussions, this year's event features a fast-paced networking dessert reception organized on the speed-dating model to maximize interaction. The format calls for having attendees change partners every few minutes during the one hour and 10 minute session, as practice for working the room at conferences and other gatherings.

Wrapping up the information session, Cavanaugh and Klotz discussed the many training opportunities and events sponsored by NTA and OFCD (see text box). The two groups are constantly refining their offerings to help trainees understand their career options and master every step in the process of pursuing the career they want, whether they end up applying their scientific training at the bench, in the classroom, in industry or government, in science communication, or elsewhere.

### Career development opportunities at NIEHS

The best way for trainees to know what is available to them at NIEHS and elsewhere is to read messages from the fellows listserv and attend NTA/OFCD meetings. The [NTA](#) and [OFCD](#) Web sites are also very helpful, and Klotz emphasized that she maintains an open door policy to help trainees get all they can from the fellowship experience.

NTA sponsors the annual Biomedical Career Fair, weekly coffees, and brown bag lunches with distinguished lecturers. The NTA also coordinates the selection of mentor of the year by trainees. The mentor of the year is recognized as part of the annual NIEHS Science Awards Day in November.

OFCD offers career exploration workshops on academia and industry, courses on scientific manuscript writing, and professional training in leadership, management, and interviewing. In recognition of the growth of online courses at every level, a new course helps trainees learn how to design distance-learning courses for the new media.

NIEHS also offers courses in improving spoken and written English for international trainees, as well as training on making effective presentations. Other experiences at the Institute, such with the Environmental Health Perspectives science outreach program, the NIH Sumer Internship program, and the monthly newsletter, the Environmental Factor, published by the Office of Communications and Public Liaison, can give trainees additional opportunities for honing their teaching and writing skills.



*Cavanaugh introduced NTA members who represent each of the labs at NIEHS on the steering committee and described the role of NTA as a liaison between the Institute's 224 trainees and NIEHS administration. (Photo courtesy of Steve McCaw)*



*Klotz, who completed her own postdoc at NIEHS, emphasized that career development experiences at NIEHS save much more time in the long run, than they demand initially of trainees with the foresight to take advantage of them. (Photo courtesy of Steve McCaw)*



*Trainee Maria Shatz, Ph.D., above, was one of several international fellows at the meeting. NTA has an international fellow subcommittee to help trainees with issues specific to trainees from other countries. (Photo courtesy of Steve McCaw)*

*Deputy Scientific Director Bill Schrader, Ph.D., right, joined Klotz in a discussion of revised evaluation procedures. Schrader also described the benefits for trainees of getting a second mentor to complement the skill set of their principal investigators, especially if they are considering a career away from the bench. (Photo courtesy of Steve McCaw)*

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## Women's history month talk takes aim at cosmetics

*By Rachel Person*

NIEHS employees were among some 75 federal employees and guests attending a Women's History Month presentation by dermatologist [Amy Fox, M.D.](#), on a topic of special interest for many women — the potential toxicity of cosmetics and personal care products. The event, held March 31 at the U.S. Environmental Protection Agency (EPA), was hosted by Renee Marshall, E.P.A. Federal Women's Chair.

Marshall opened the program by showing a video with consumer advocate and social critic [Annie Leonard](#) exploring concerns about the safety of the thousands of chemicals found in products sold in stores worldwide.

### A dermatologist's perspective

Fox's presentation was framed around a discussion of cosmetics, recent debates, and, more importantly, the need for people to take the initiative to make safe and healthy choices about personal care products. According to Fox, contrary to what consumers might assume, these over-the-counter (OTC) products are only nominally regulated by the U.S. Food and Drug Administration (FDA).



*While Fox, above, shares the concerns of such consumer advocates as Leonard, her presentation was balanced as she described the paucity of solid evidence about cosmetic safety. (Photo courtesy of Steve McCaw)*



A third-year resident at the University of North Carolina at Chapel Hill (UNC-CH) who will join the faculty of UNC-CH as an assistant clinical professor after her graduation in July, Fox said she became interested in the safety of personal care products when she began to read the ingredients lists carefully. Her interest intensified when she became a mother and saw that even baby care products often included ingredients she'd never heard of before.

### Regulation of cosmetics

Fox opened her presentation by making a distinction between what the word cosmetics means to physicians and what it means to consumers. From a dermatologist's perspective, Fox said, cosmetics are FDA-approved and regulated products such as botox. For the average consumer, however, the term refers to such loosely regulated products as lipstick, mascara, rouge, or any over-the-counter (OTC) personal care product.



*NIEHS scientists Cathy Sprankle, left, and Eleni Salicru, Ph.D., were among the people who turned out for the presentation, which drew a capacity audience to a meeting room in the EPA conference center. (Photo courtesy of Steve McCaw)*

As Fox explained, in the 1930s the FDA became the regulatory body for cosmetics, while leaving safety measures to the manufacturers. In 1976, the industry trade association now known as the Personal Care Products Council established the [Cosmetic Ingredient Review \(CIR\)](#) panel to perform independent reviews of product components.

The seven-member CIR panel creates an annual list to prioritize the 10,000 possible ingredients that may be found in OTC cosmetics. Unfortunately, only 20 products are evaluated per year based on two criteria — the frequency certain ingredients are found in OTC products and the level of possible systemic absorption. “How to evaluate them all,” said Dr. Fox, “is a momentous challenge.” She said that fewer than one-tenth of the ingredients consumers can potentially be exposed to have undergone review by CIR.

According to Fox, studies of the toxicity of consumer products have produced mixed results. Although some have found *in vitro* evidence of genotoxicity in such products as permanent hair dyes, and epidemiological studies have suggested links to cancer, the CIR panel review in 2005 did not substantiate subsequent *in vivo* evidence.

### Caveat emptor

Fox said that the personal care product industry has annual sales of some \$50 billion. She reminded the audience that the industry is driven by the profit motive and employs sophisticated marketing techniques to entice buyers with images of purity and beauty. As with any other product, Fox cautions, consumers have a responsibility to be smart about what they buy and take the time to read the labels.

She also warned that so-called natural products are not necessarily any safer. “They can be just as toxic as synthetic products... [and] replete with other ingredients,” she said.

(Rachel Person, Ph.D., is a postdoctoral fellow in the NTP Inorganic Carcinogenesis Branch.)

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# EHP and NIEHS celebrate Earth Day 2011

*By Eddy Ball*

The journal Environmental Health Perspectives (EHP) is celebrating the 41st anniversary of Earth Day, the birth of the modern environmental movement, with a [special page](#) published on April 22 that will stay online for a month. Featured on the page are recently published EHP materials in keeping with the Earth Day theme, linked by striking air, water, land, and climate icons.

Earth Day also happens to be the 18th anniversary of the launch of EHP as a monthly journal. Originally founded in 1972, the journal first served as a vehicle for publishing conference proceedings in the then newly emerging field of environmental health. In 1993 EHP adopted its current format, publishing news and original research. With an impact factor of 6.19, EHP is currently the top-ranked original research journal in the category of public, environmental, and occupational health, according to Journal Citation Reports® Science Edition.



*Not surprisingly, materials on global climate change, represented in this beautiful and disturbing image of a melting glacier, are an important part of the special EHP Earth Day compilation. (Photo courtesy of EHP)*

As EHP's editorial staff explains, Earth Day resources will be diverse enough to appeal to a broad range of audiences, with a compilation of recent EHP news features, perspectives, commentaries, reviews, science education lessons, and podcasts.

## **The celebration continues at NIEHS**

Along with individual planet-nurturing measures, Earth Day activities for NIEHS employees will take place May 4-5 at the main NIEHS campus and the Keystone Building in Research Triangle Park, N.C. The events will include informative exhibits on hybrid and electric vehicles, diesel vehicles, recycling, composting, and the NIEHS Environmental Management System and storm water provisions. Coffee will be provided by a local coffee vendor noted for its sustainability practices.

The Earth Day celebrations are organized and coordinated by the NIEHS Environmental Awareness Advisory Committee.

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